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ULF SIVHED

LOWER JURASSIC OSTRACODES AND STRATIGRAPHY OF WESTERN SKÅNE, SOUTHERN SWEDEN

WITH TWELVE PLATES

Lund 1980

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LOWER JURASSIC OSTRACODES AND STRATIGRAPHY OF WESTERN SKÅNE, SOUTHERN SWEDEN

av

ULF SIVHED
Fil. kand., Ssk

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Address:

Ulf Sivhed
Sveriges geologiska undersökning
Tunavägen 35
S-223 63 LUND

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Abstract

Lower Jurassic sections from eighteen localities situated in northwestern and western Skåne have been sampled and described. From a lithostratigraphic point of view the sections treated belong to the Döshult, Pankarp, Katslösa, and Rydebäck Members of the Rya Formation. Forty-one ostracode species have been recorded, seven of which are described as new. These ostracodes indicate two ostracode zones, the *Cristacythere betzi–C. crassireticulata* Zone and the *Ogmoconchella danica* Zone. These zones are of Sinemurian and Pliensbachian ages.

Introduction

Lower Jurassic sediments are known from different parts of Skåne (Fig. 1). Sven Nilsson was the first to describe fossils from that series. He described fossil plants from the Liassic Höör Sandstone (1819, 1820a, 1820b). In several later publications (1823, 1831a, 1831b) Nilsson described both the fossil fauna and flora from Rhaetic and Liassic sediments of Skåne. These fossil records made it possible to date the sediments and also to distinguish the Jurassic Höör Sandstone from the Cambrian Hardeberga Sandstone. Since then several authors have treated the Lower Jurassic sequence from different aspects. Nathorst (1886 and other publications) treated the flora and Lundgren (1888 and other publications) studied its fauna. Nathorst (1894, pp. 163–185) recapitulated the prevailing knowledge of the Jurassic including the Rhaetic in Skåne. Erdmann (1911–1915) made a comprehensive interpretation of the coal-bearing sediments in Skåne. There is a great deal of information on Jurassic geology in his publication. Hadding (1927, 1929) treated the Upper Triassic and Lower Jurassic sediments from a sedimentologic point of view. Troedsson (1951, pp. 1–268) made a comprehensive description of the Upper Triassic and Liassic sediments and their fauna in the northwest part of Skåne. Bölau has published several papers on the same subject (the latest publication: 1973, pp. 268–272). Lundblad (1959 and other publications) has treated the flora in Rhaetic and Liassic sediments in Skåne. Reyment (1959, pp. 103–157) made a recapitulation of the ammonite fauna in Jurassic sediments in Skåne. He also described ammonites recorded from the Gantofta Brick Pit (1969a, pp. 210–216; 1969b, pp. 440–442). Vossmerbäumer (1969, pp. 112–126 and other publications) treated environmental conditions in association with rootlet-beds in Hettangian sediments in the northwest part of Skåne. Norling has treated the geology and the foraminiferal contents of the Jurassic sequence in Skåne in several papers (the most important 1972). The new lithostratigraphic subdivision of the Upper Triassic and the Jurassic sequences in Skåne, made by Erik Norling in Uppsala (personal communication 1979) is followed in this paper.

Until my first paper on Liassic ostracodes from the northwest part of Skåne was published (Sivhed 1977) very little was known about them in Skåne. However, some ostracodes from this area were described by Troedsson (1951) and Norling (1972).

The investigation was mainly carried out on core material as exposures in the treated sequences are very rare. The investigated material originates from thirteen borings and four outcrops. The documentation from nine of the borings belongs to the Höganäs Company, that of the remaining four, to the Geological Survey of Sweden. It has only been possible for the author to visit two of the four outcrops as two of them no longer exist. Material from these two localities has been borrowed from collections made by others.

The ostracodes were obtained from sediments of the Döshult, Pankarp, and Katslösa Members of the Rya Formation (lithostratigraphic subdivision according to Norling, personal communication 1979). The ostracodes are often poorly preserved and have a low frequency in the samples treated. When possible to identify them they form a most useful tool in biostratigraphic correlation (Figs. 2, 3). In the present investigation forty-one ostracode species are recorded, seven of which are described as

new. Some of the ostracode zones and subzones as described by Michelsen from the Danish Embayment are recognized in the present material.

The lithology of the sections treated is also described. The lithologic composition of the different members is quite characteristic which makes it easy to distinguish the individual members. Their composition is very stable in the area treated (with a few exceptions) and no important lithologic changes are indicated laterally. They correspond also to those described by Larsen (1966) and Michelsen (1975) from Öresund.

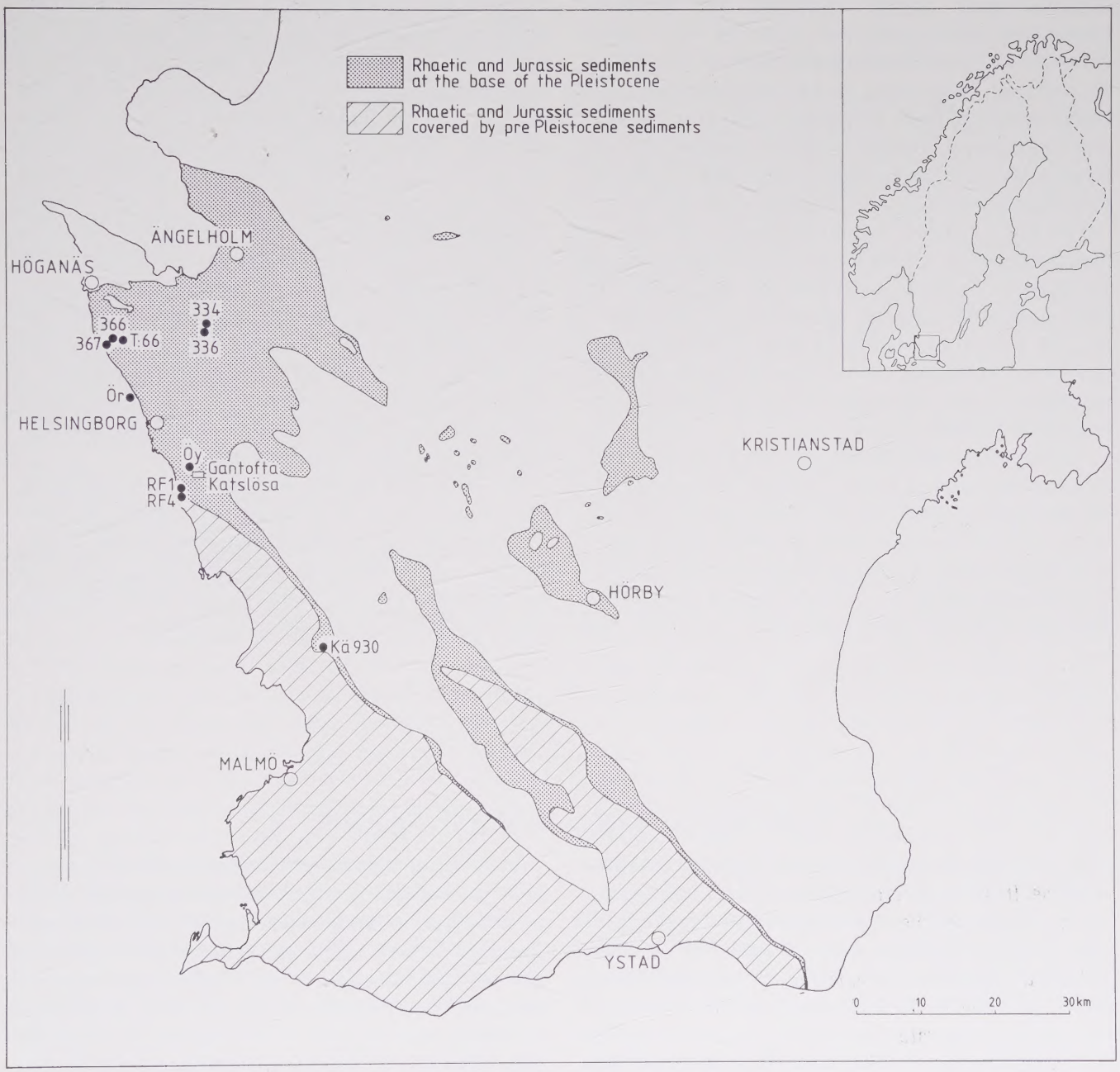


Fig. 1. The distribution of Rhaetic and Jurassic sediments in Skåne. The abbreviations (explained on p. 39) refer to the localities treated in this paper.

The Rya Formation–environment of deposition

The sediments of the Rya Formation (Norling, personal communication 1979) were formed under more or less marine conditions. The sandy and silty sediments of the Döshult Member, the lowermost member, were probably deposited in shallow water in a coastal area (Larsen 1966, p. 29). The argillaceous horizons indicate a marine low-energy environment.

The sediments of the superimposed Pankarp Member are mainly made up of variegated clays and claystones deposited under marine conditions. The variegated colours (red, brown, green, and yellow) are due to different oxidation levels of iron (Bölau 1954, pp. 224–226) in the sediment. Bölau (1954, pp. 224–226) points out that a higher content of Fe_2O_3 in relation to FeO gives the sediment a red colour. This phenomenon, together with different rates of sedimentation (Larsen 1968, p. 25), has probably caused the variation in colour of the sediment.

The sandy horizons with a coal seam in the Pankarp Member represent a shallowing of the deposition area and an outwash of plant material from the source area. The plant material was probably transported and deposited as the coal seam in the sediments of the Pankarp Member consists of irregularly orientated plant debris. Another argument for this assumption is that no rootlet-bed has been found beneath the coal seam.

The following member, the Katslösa Member, is characterized by a clearly marine sequence with an increasing arenaceous content upwards in the section. The calcium carbonate content varies throughout the sequence.

Troedsson (1938, p. 517) suggested an Early Sinemurian sediment transport direction (forming the Döshult Member) from the southwest. This conclusion was based on a recorded increasing argillaceous content of the sediment in a northwesterly direction. In one of Troedsson's major observations, a core interval in the Vilhelmsfält drill-core, the sequence was erroneously referred to the Early Sinemurian, the Döshult Member. As shown by Bölau (1959, p. 188), Guy (1971) and others, the core interval in question is much younger, in fact, of Middle Jurassic age.

When describing the Mesozoic sediments of the Öresund area Larsen (1966, p. 89) suggested a Jurassic sediment transport direction from the southeast to the northwest. An observed lack of epidote and hornblende may indicate, according to Larsen (1966, pp. 78, 91), that the source of the Jurassic sediments in the area treated was older sedimentary rocks. The minerals in question are not only characteristic components in metamorphic rocks, but in the Jurassic sediments of the Danish-Norwegian Basin also. Larsen's observations from the Jurassic sequence of the Öresund area could be applied to the strata treated in the present paper, since the sequences of Öresund and adjacent northwestern Skåne are closely related from a lithologic point of view. Concerning the lack of epidote and hornblende there is, however, a possibility that these minerals have been broken down before or during the sedimentation, or in connection with diagenetic changes of the sediments.

The sediments treated were formed in a near-shore area surrounded by land masses to the north and east. The source of the sediments treated was probably sedimentary rocks (Palaeozoic and Mesozoic) as well as crystalline rocks weathered and transported by rivers and water courses into the area of sedimentation.

LITHOSTRATIGRAPHY AND BIOSTRATIGRAPHY

Lower Jurassic sequences are known from different parts of Skåne. It is, however, almost impossible to distinguish Lower Jurassic sediments from Rhaetic, Middle Jurassic and Upper Jurassic ones merely on lithologic grounds. This fact, together with the lack of biostratigraphic data from a great deal of the drill-cores from Jurassic sequences in Skåne, motivates the lumping together of Rhaetic and Jurassic strata as in Fig. 1, in which the distribution of the discussed strata in Skåne is shown. The basis of the map are well data, outcrops and geophysical information.

As Liassic sediments are developed differently in different parts of Skåne the only sediments described in the present paper are those which have yielded ostracodes. These sediments belong to the Rya Formation (Norling, personal communication 1979). The formation is restricted to the northwestern and western parts of Skåne, as well as the adjacent parts of the Öresund. For abbreviations see p. 39. The members which have yielded ostracodes (Fig. 2) are described below.

DÖSHULT MEMBER

Troedsson (1951, p. 38) described a sequence of crossbedded sandstones and subordinated siltstones from the Döshult area under the name Döshult Beds. Since then several authors have treated the sequence, using varying lithostratigraphic classification, including and excluding different parts of the Liassic sequence. The lithology and fossil content of the Döshult Member was described by, among others, Lundgren (1888), Nathorst (1894), Bölau (1959, 1973), Larsen (1966), Larsen et al. (1968), Reyment (1969a, b), Norling (1977a, b) and Sivhed (1977).

The Döshult Member, as treated in this paper, consists in its lower and middle parts of sandstones and siltstones, partly crossbedded, with some argillaceous intercalations and very thin carbonaceous layers. The underlying sediment, which belongs to the Helsingborg Member of the Höganäs Formation, is made up of thin laminated sandstone or siltstone intercalated with thin argillaceous coal yielding beds. The upper part of the Döshult Member is mostly made up of dark grey to greyish black, sometimes bluish grey claystone (15–25 m thick) sometimes with thin sandy horizons and with thin ironclay horizons as well as thin limestone beds. The Döshult Member has a maximum thickness of 90 m in the sections investigated (Gantofta No. 359 drill-core). In Pankarp-Strövelstorp No. 334 drill-core the entire thickness is 72 m.

Lundgren (1881, p. 12) described a rich bivalve fauna dominated by representatives of *Avicula inaequivalvis* at Kulla Gunnarstorp (about 13 km south of Höganäs). He also described the occurrence of ammonites at different localities. He named the two horizons the *Avicula* Bank and the Ammonite Bank (1878, p. 26). In 1951 (p. 120) Troedsson subdivided the Döshult Member into three biostratigraphic units, the basal *Avicula* Bank, the Ammonite Bank, and the Myacid Bank. The Myacid Bank is named after the occurrence of bivalves of the genus *Myacites* frequently represented at that level. However, according to Bölau (1973, p. 270), the Myacid Bank is situated in the uppermost part of the Pankarp Member.

The ammonites recorded from the Döshult Member indicate the following ammonite zones: *The Arnioceras semicostatum* Zone (Reyment 1959, pp. 103–157), the *Caenisites turneri* Zone (Bölau 1959, p. 187), and the *Aesteroceras obtusum* Zone (Reyment 1969a, pp. 208–216).

The ostracodes obtained from the Döshult Member are mostly restricted to its argillaceous parts. The ostracodes are most frequent in the upper part of the member. Ostracodes representing the *Cristacythere betzi–C. crassireticulata* Zone as well as representatives of the overlying *Ogmoconchella danica* Zone are recorded. The lowermost subzone of the *O. danica* Zone, the *Progonoidea reticulata* Subzone, is indicated by its zonal denominator.

The sediment of the Döshult Member was deposited under marine conditions. This is indicated by the presence of marine fossils such as ammonites and ostracodes, as mentioned above, and also by foraminifers (Norling 1972) and echinoderms (in locality No. T:66, see p. 38).

PANKARP MEMBER

Troedsson (1951, pp. 73, 120) reported non-marine deposits made up of reddish arenaceous clay and sand. This sequence is situated between sediments of the Döshult and Katslösa Members in the Katslösa section. Bölau (1954, pp. 219–220) reported a sequence of red coloured clays from well-cuttings at Östraby, about 18 km E. of Höganäs (material from that drilling is no longer available). In 1959 (pp. 178–179) the same author confirmed that these sediments and also sediments of equal lithologic character from other localities belong to the Upper Sinemurian ("Lias beta").

Sections of the Pankarp Member have been treated by Norling (1972, pp. 8–9; 1977a, p. 454; 1977b, p. 28; personal communication 1979) and Bölau (1973, pp. 268–272). The same type of sediment is also reported from the Öresund area by Larsen (1966, pp. 29–33), Larsen et al. (1968) and Michelsen (1975, p. 83).

The sediments of the Pankarp Member are referred to the Upper Sinemurian. The biostratigraphic evidences are that the sequence is underlain by an ammonite yielding horizon (Reyment 1969, pp. 208–218) indicating the lower and upper subzones of the *Asteroceras obtusum* Zone, corresponding to the lower part of the Upper Sinemurian. Hoffman (in Bölau 1959, p. 187) reports the occurrence of the *Microderoceras birchi* Subzone at 103 m in Pankarp-Strövelstorp No. 334 drill-core. This level is situated immediately below sediments of the Pankarp Member. This subzone represents the upper part of the *Caenisites turneri* Zone, corresponding to the lowermost part of the Upper Sinemurian. The Katslösa Member, overlying the Pankarp Member, has yielded fragments of the ammonite *Uptonia jamesoni* (Troedsson 1951, pp. 77, 241). The *U. jamesoni* Zone indicates the Lower Pliensbachian.

Only a few ostracodes have been found in sediments of the Pankarp Member. The ones recorded show a varying state of preservation. The section below the sandy hori-

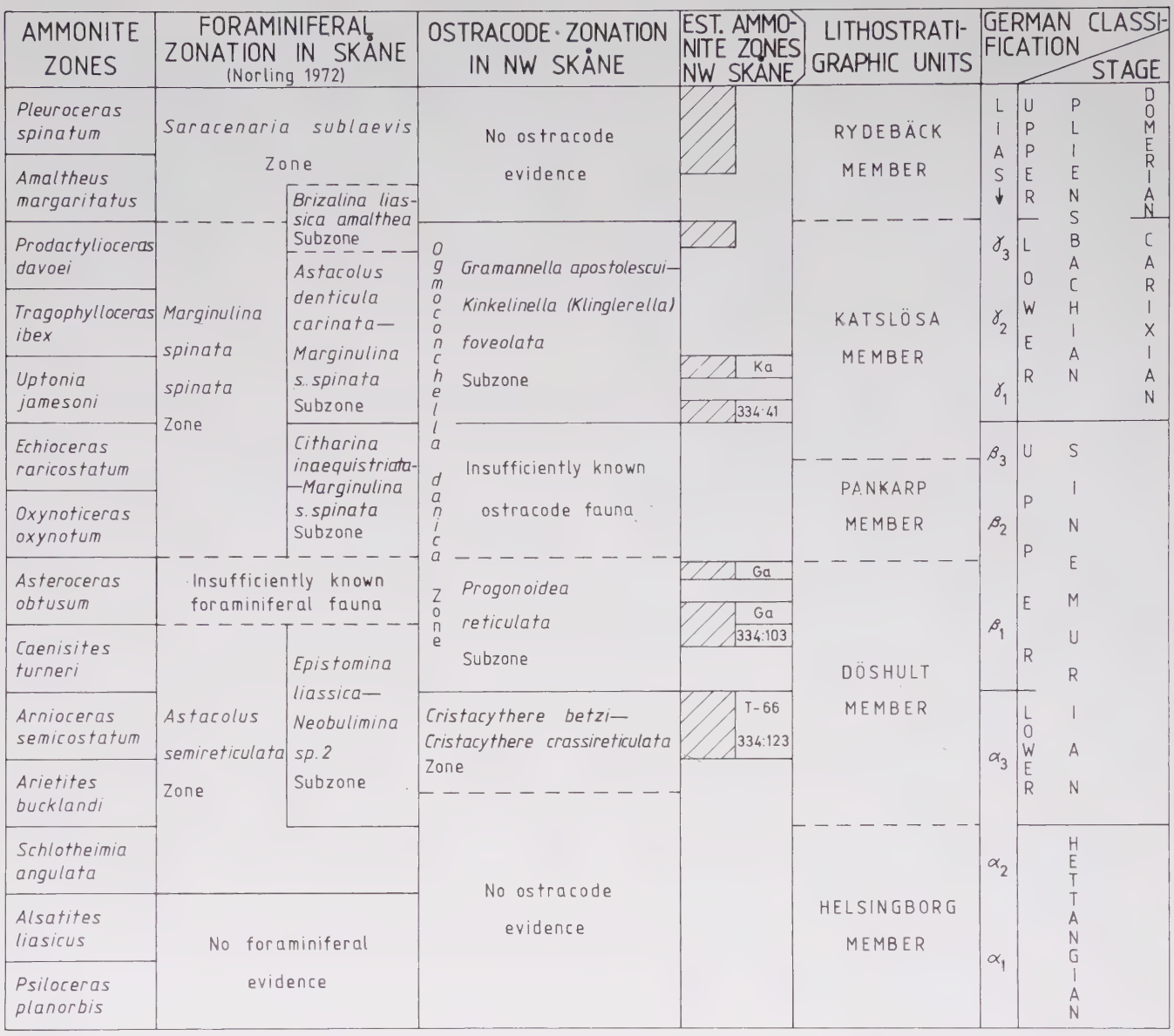


Fig. 2. The correlation of the biostratigraphic and lithostratigraphic units in Skåne with the international stages and ammonite zonation of the Jurassic (Hettangian–Pliensbachian). Lithostratigraphy after Norling (personal communication 1979).

zon (regarding the position of the sandy section, see below), seems to belong to the *Progonoidea reticulata* Subzone since a well preserved specimen of the ostracode *P. reticulata* has been identified in Pankarp-Strövelstorp No. 334 drill-core, sample No. 48.

In the lower part of the section above the sandy horizon in Rydebäck-Fortuna No. 1 drill-core, sample No. 123, specimens of the ostracode *Kinkelinella triebeli* have been recorded, indicating the upper part of the *P. reticulata* Subzone and the lower part of the middle subzone of the *Ogmoconchella danica* Zone. In the uppermost part of the Pankarp Member specimens of *Pleurifera harpa* (336:21) and specimens of *"Ogmoconchella" mouhersensis* (334:36, 336:21) are recorded. *"O." mouhersensis* ranges from the middle to the upper subzone of the *O. danica* Zone and *P. harpa* is restricted to the upper subzone in the Danish Embayment. The latter occurs also in the upper part of Lias beta (Upper Sinemurian) in Northern Germany (Klinger & Neuweiler 1959, p. 307). The biostratigraphic evidence is poor. Is the upper subzone of the *O. danica* Zone represented? Is the Pankarp Member restricted to the Upper Sinemurian or does it also include part of the Lower Pliensbachian (see also p. 12)?

The sediments of the Pankarp Member were mainly

deposited under marine conditions (Larsen 1966, p. 29, Norling 1977a, p. 455; 1977b, p. 28, Fig. 4). They are made up of variegated clays and conspicuous sandy horizons in their upper part. The sandy horizon contains mainly a thin coal seam (5–15 cm) or in some cases only coal fragments. The sandy horizon indicates a shallowing of the deposition area. Larsen (1966, p. 2) and Norling (1977a, p. 455; 1977b, Fig. 4) suggest that the sandy sediment was deposited in a deltaic environment. The coal in the sandy horizon seems to be outwashed material. In the available samples studied for the present paper, the coal seam contains plant material irregularly oriented partly in a sandy matrix. No rootlet-beds have been observed. The core recovery is commonly rather low in the sandy section.

As mentioned earlier, the sequence is made up of a series of variegated clays. Its lower boundary is drawn at varying levels by different authors. In this paper, the reason for drawing the lower boundary at the level where the greyish black claystone referred to the Döshult Member is succeeded by red claystone is as follows. The change in colour is very conspicuous and it is therefore very easy to distinguish the boundary in the field as well as in the laboratory. The boundary is developed in the same way in nearly all known localities. This boundary is exposed in the Gantofta Brick Pit about 2 m above the ammonite yielding zone described by Reyment (1969, pp. 208–216). In Pankarp-Strövelstorp No. 334 drill-core the boundary is drawn at 103 m. The upper boundary is drawn where the grey to bluish grey and slightly greenish grey clay of the Pankarp Member is succeeded by the arenaceous sediments of the Katslösa Member. This boundary is drawn at 46 m in Pankarp-Strövelstorp No. 334 drill-core. The sequence is made up of clays and claystones with subordinate sandy horizons.

A representative profile is composed as follows. Basally 6 to 30 m red, brown and brownish yellow clay and claystones succeeded by 10–17 m grey to bluish grey, in some cases greenish grey clay or claystone. Above this sequence of argillaceous sediment a sandy horizon follows. It is made up of a loose sand with argillaceous horizons and the sequence also contains a thin coal seam (5–15 cm) or a thin horizon with coal fragments. The sandy horizon is overlain either by brownish and reddish clays (about 15 m thick) or by a greyish to bluish grey claystone (about 15 m thick), in its turn overlain by a reddish and brownish clay (about 8 m thick). The uppermost part of the Pankarp Member is made up of grey to bluish grey claystone, as well as thin horizons of greenish grey claystone (7 to 15 m thick). This horizon is sometimes slightly arenaceous in its uppermost part.

KATSLÖSA MEMBER

The Katslösa Member was originally described by Troedsson (1951, pp. 66–80, 120–121) under the designation the Katslösa Stage. He came across sediments of this stratigraphic unit, occasionally exposed in a ditch, situated between Gantofta and Katslösa. He described the lithology and faunal composition of this section and reported i.a. the occurrence of the ammonite *Uptonia jamesoni,* indicating an Early Pliensbachian age. The Katslösa section is treated in this paper under the designation the Katslösa Exposure.

Sediments of the Katslösa Member are reported from northwest Skåne and the adjacent parts of the Öresund area as well as from the Kävlinge-Lund area. Bölau (1959, pp. 167–188, 197; 1973, pp. 268–272) described the lithology and fossil content of the Katslösa Member in drill-cores from Katslösa (620) and Pankarp-Strövelstorp (Nos. 334, 336 and others). The fossils which he reported refer parts of the section to the *Phricodoceras taylori* Subzone of the *Uptonia jamesoni* Zone. Norling (1972) described the foraminiferal fauna from several sections referred to the Katslösa Member. Sediments of the Katslösa Member are also reported from Öresund by Larsen (1966) and Larsen et al. (1968). Michelsen (1975) treated the ostracode fauna in the cores and well cuttings described by Larsen.

The sediments of the Katslösa Member are made up of greenish, brownish, and greyish black claystones and sandstones with a varying ferruginous content. Thin oolitic as well as limy horizons also occur. Troedsson estimated the thickness of the Katslösa Member to 115 m in the Katslösa section (1951, p. 121). The maximum thickness recorded in the present investigation is, however, only 49 m (RF1). The boundary between sediments of the Katslösa Member and the underlying Pankarp Member is drawn by me where the arenaceous clays or the sandstones of the Katslösa Member are underlain by the grey or bluish grey clay of the Pankarp Member. The Katslösa Member is succeeded upwards by a variegated, more sandy, silty, ferruginous and also partly conglomeratic sequence, the Rydebäck Member (Norling 1972, pp. 11–12). The boundary between the two members is drawn arbitrarily in the sandy, silty sequence, as there is no sharp lithologic change between them.

The Katslösa Member has yielded a fairly rich ostracode fauna. Representatives of the *Gramannella apostolescui–Kinkelinella foveolata* Subzone and the middle subzone of the *Ogmoconchella danica* Zone are recorded.

Ammonite zonation of the Lias in northwest Skåne

In the northwest European Lias ammonites are excellent tools for biostratigraphic correlation. Dean, Donovan and Howarth (1961, pp. 438–505) gave a subdivision of the Liassic ammonite fauna in northwest Europe. They also illustrated (1961, Pl. 75) the geographic distribution of the northwest European ammonite faunal province of the Lias, including Skåne. The ammonite zonation (Fig. 2) used in the present publication is that of Colloque du Jurassique à Luxembourg 1962.

Evidence of seven ammonite zones in northwest Skåne (Fig. 2) is rendered in the literature. The ammonite fauna in northwest Skåne has been treated by Lundgren (1881, pp. 50–56), Troedsson (1951, pp. 240–241), Reyment (1959, pp. 103–156; 1969a, pp. 210–216; 1969b, pp. 440–442), and by Hoffman (in Bölau 1959, pp. 186–188). The ammonite zones recorded in Sinemurian and Pliensbachian sediments in northwest Skåne are as follows:

Psiloceras planorbis Zone to *Arietites bucklandi* Zone: No finds.

Arnioceras semicostatum Zone: Completely developed (Reyment 1959, pp. 145–146, Bölau 1959, p. 187). Reyment (1959, p. 144) is of the opinion that there is a possibility that the recorded specimens of *Megarietites meridionalis* indicate the *Arietites bucklandi* Zone. This species is, however, according to Dean, Donovan & Howarth (1961, p. 451) referred to the lowermost subzone of the *A. semicostatum* Zone, the *Coroniceras reynesi* Subzone.

Caenisites turneri Zone: The upper subzone, the *Microderoceras birchi* Subzone (Hoffman in Bölau 1959, p. 187), is indicated. The ammonites which are the basis for identification are, however, poorly preserved.

Asteroceras obtusum Zone: The lower and upper subzones, the *A. obtusum* and the *Eparietites denotatus* Subzones, are determined (Reyment 1969a, pp. 208–216). No indications of the *Asteroceras stellare* Subzone, the middle subzone, are recorded.

Oxynoticeras oxynotum Zone: No finds.

Echioceras raricostatum Zone: No finds.

Uptonia jamesoni Zone: The lower subzone, the *Phricodoceras taylori* Subzone is indicated by *Polymorphites lineatus* (Hoffman in Bölau 1959, pp. 186–187). The upper subzone, the *U. jamesoni* Subzone is also indicated (Troedsson 1951, pp. 77, 241). The ammonites, which are the basis for identification are, however, poorly preserved. No indications of the middle subzone are recorded.

Tragophylloceras ibex Zone: No finds.

Prodactylioceras davoei Zone: The upper subzone, the *Oistoceras figulinum* Subzone is, according to Reyment (1959, p. 149), indicated by fragments of *Oistoceras* identified by Hoffman from about 180 m depth in the Vilhelmsfält drill-core. However, Hoffman (in Bölau 1959, p. 188) does not mention any such fragments from this drill-core.

Amaltheus margaritatus Zone: The upper subzone, the *A. gibbosus* Subzone, is indicated by *Onychoceras laevis* (Hoffman in Bölau 1959, p. 188).

Pleuroceras spinatum Zone: The zone is indicated by specimens of *P. spinatum* (Hoffman in Bölau 1959, p. 188).

In the profiles investigated by the present author ammonites have been reported from Pankarp-Strövelstorp No. 334 drill-core, the Gantofta Brick Pit, the Katslösa exposure, and the Marl Pit named locality No. 66 by Troedsson. The levels of these findings are indicated in Fig. 2.

In Pankarp-Strövelstorp No. 334 drill-core the *Phricodoceras taylori* Subzone of the *Uptonia jamesoni* Zone is reported at 41.0 m. At 103.0 m a poorly preserved ammonite is recorded, determined as *Microderoceras* sp. (cf. *birchi* (SOWERBY)) by Hoffman (in Bölau 1959, p. 187), indicating the *Microderoceras birchi* Subzone of the *Caenisites turneri* Zone. The *Arnioceras semicostatum* Zone was indicated by specimens of *A.* cf. *pseudokridion* at 123.3–123.5 m. The material is determined by Hoffman (in Bölau 1959, p. 187).

In the upper part of the Gantofta section evidence for the *Asteroceras obtusum* Zone has been recorded (Reyment 1969a, pp. 208–216; 1969b, pp. 440–442). The occurrence of specimens of *A. obtusum* indicates the *A. obtusum* Subzone and the occurrence of *Promicroceras planicosta* indicates the *Eparietites denotatus* Subzone.

In the Katslösa exposure the occurrence of a questionably determined specimen of *Uptonia jamesoni* at 840 m was reported by Troedsson (1951, p. 77). *U. jamesoni* indicates the upper subzone, the *U. jamesoni* Subzone, of the *U. jamesoni* Zone. In the Döshult area representatives of the three subzones of the *Arnioceras semicostatum* Zone are reported (Reyment 1959, pp. 103–157).

Ostracode zonation

The ranges of identified ostracodes are shown in Fig. 3. In that illustration the ranges in north and central Europe are included.

THE *CRISTACYTHERE BETZI–C. CRASSIRETICULATA* ZONE

This zone was defined by Michelsen (1975, p. 26). It is characterized by the occurrence of the ostracodes *C. betzi* and *C. crassireticulata*. This zone is hitherto the oldest Jurassic ostracode zone indicated in Skåne. No evidence of the *Ogmoconchella aspinata* Zone, the oldest Jurassic ostracode zone recorded in the Danish Embayment, has been found. The upper boundary of the *C. betzi–C. crassireticulata* Zone is drawn just below the first occurrence of the ostracode *O. danica,* indicating the *O. danica* Zone. In one case specimens of *C. crassireticulata* have been found in the *O. danica* Zone, viz. 3.5 m above the first occurrence of *O. danica* in Gantofta No. 360 drill-core. In the Gantofta Brick Pit the first recorded occurrence of *O. danica* and the last of *C. crassireticulata* coincide. Representatives of eighteen ostracode species have been recorded in this zone. Five of these are described as new species. Two species are restricted to the zone in Skåne viz. *Acrocythere* cf. *gassumensis* and *Paracypris*? *redcarensis*. Nine of the species represented in Skåne have been reported from the same stratigraphic level in the Danish Embayment, four in France, three in Germany and three in Great Britain. One or two ostracode species usually occur in each sample. However, one sample has yielded six species and forty have not yielded any ostracodes at all. The number of specimens recorded varies also. Usually a species is represented by two or three specimens in one sample.

The ammonite evidence within the zone is weak. Michelsen has not accounted for any ammonites in his sequences. Reyment (1959) described the occurrence of the entire *Arnioceras semicostatum* Zone in the Döshult area in Skåne. However, it is uncertain where exactly the ammonites were found. The localities are only referred to as the Döshult area, the ammonite bank at Döshult or the Marl Pit at Döshult. The ammonites, at least some of them, have most likely been collected at locality No. 66 (Troedsson), as for instance *Cymbites striaries*. Reyment mentions that specimens of this species are recorded at "the marl pit at Döshult". *C. striaries* indicates the upper subzone, the *Euagassiceras sauzeanum* Subzone, of the *A. semicostatum* Zone. The *C. betzi–C. crassireticulata* Zone might therefore be correlated with at least the upper part of the *A. semicostatum* Zone. The ostracode zone has a thickness of about 15 m.

THE *OGMOCONCHELLA DANICA* ZONE

This zone was defined by Michelsen (1975, pp. 28–38). The lower boundary of the zone is placed at the first occurrence of the ostracode *O. danica*. The upper boundary is placed at the uppermost occurrence of the ostracodes *Gramannella apostolescui, Kinkelinella foveolata* or *Monoceratina amlingstadtensis*. *M. amlingstadtensis* has not been recorded by me. Michelsen (1975, pp. 28–38) divided the *O. danica* Zone into three subzones. He named the lower subzone the *Progonoidea reticulata* Subzone. The middle subzone was not given a name, and the upper one he called the *Gramannella apostolescui–Kinkelinella foveolata* Subzone. These divisions discriminated by Michelsen have been followed in the present publication.

In the Danish Embayment the *Progonoidea reticulata* Subzone is dominated by the ostracodes *Ogmoconchella danica* and *Progonoidea reticulata* (Michelsen 1975, p. 29). Very few specimens of *P. reticulata,* however, have been found in the present profiles. In the present investigation the lower boundary of the *P. reticulata* Subzone is placed at the first occurrence of *O. danica*. The first observation of this species was made in the upper part of the Döshult Member, in the greyish to greyish-black claystone. This lower boundary has been easy to distinguish in the present profiles, as *O. danica* is well represented in the lower part of the subzone. In drawing the upper boundary of the subzone, however, problems have arisen as very few specimens could be assigned with confidence to *P. reticulata*. The uppermost recorded specimen of *P. reticulata* is found about 8 m above the boundary between the Pankarp and Döshult Members in Pankarp-Strövelstorp No. 334 drill-core.

The entire thickness of the *P. reticulata* Subzone is about 25 m in Pankarp-Strövelstorp No. 334 drill-core when locating the upper boundary at the last occurrence of *P. reticulata*. The Subzone seems to be thicker in the Gantofta area. In the Gantofta Brick Pit its extension is 35 m in the Döshult Member while the extension is insufficiently known in the Pankarp Member.

In the present investigation twenty ostracode species have been recorded in the *P. reticulata* Subzone, four of which are described as new species. Two species are (in northwest Europe) restricted to the subzone discussed, viz. *P. reticulata* and *Acrocythere rectangula*. One or

two species have been recorded per sample, four samples have yielded a maximum of six species and about forty samples have not yielded any ostracodes at all. Of the distinguished species eleven occur at the same stratigraphic level in the Danish Embayment, two in France, five in Germany and two in Great Britain.

The *P. reticulata* Subzone was correlated with the *Promicroceras capricornoides* Subzone (ammonite zonation) by Michelsen (1975, p. 32) which is equivalent to the *Microderoceras birchi* Subzone of the *Caenisites turneri* Zone (Dean, Donovan & Howarth 1961, p. 454). Michelsen based his statement on the occurrence of *P. reticulata* in Germany. There, this species is restricted to the ammonite subzone mentioned (Klingler & Neuweiler 1959, p. 575). In two of the sections treated, referred to the *P. reticulata* Subzone, some ammonites have been recorded. In Pankarp-Strövelstorp No. 334 drill-core one fragmentary ammonite has been found at 103 m. This specimen was referred to the *M. birchi* Subzone by Hoffman (in Bölau 1959, p. 187). In the Gantofta Brick Pit Reyment (1969a, pp. 208–216) has obtained a fairly rich ammonite fauna indicating the *Asteroceras obtusum* Zone. These observations are made in sediments of the Döshult Member immediately below the boundary to the Pankarp Member. Both these observations refer the *P. reticulata* Subzone to the upper subzone of the *C. turneri* Zone and the entire *A. obtusum* Zone. Whether the *P. reticulata* Subzone extends into the *Oxynoticeras oxynotum* Zone is impossible to decide on the basis of the present material.

The middle subzone of the *Ogmoconchella danica* Zone was defined by Michelsen (1975, pp. 32–34). In the Danish Embayment it is dominated by the ostracodes *O. danica* and *"Ogmoconchella" mouhersensis*. Its lower boundary is placed directly above the last occurrence of *Progonoidea reticulata* and its upper boundary between the last occurrence of *Kinkelinella variabilis* and the first of *Gramannella apostolescui* by Michelsen.

It has been difficult to pinpoint the lower boundary of the subzone in the present material as this part of the section has yielded very few ostracodes. The lower boundary is therefore drawn arbitrarily. The upper boundary has also been difficult to distinguish as representatives of *Kinkelinella variabilis* and *G. apostolescui* overlap each other in their vertical ranges. The upper boundary is therefore drawn immediately below the first appearance of representatives of one or more of the species *G. apostolescui, G. laevigata, Ogmoconcha amalthei amalthei,* and *Pleurifera harpa*. This distinction is made as the fauna upwards in the section is partly characterized by these species. There is also a clear change in the density of the ostracode fauna. In the middle subzone it is very poor compared to the rich fauna of the *G. apostolescui–K. foveolata* Subzone. It is therefore sensible to refer the section with a rather homogenous faunal composition and density to a single subzone instead of trying to distinguish additional subzones in the sections with *K. variabilis* and *G. apostolescui*. The ostracode fauna (of the middle subzone) is dominated by specimens of *O. danica* and *"O". mouhersensis*.

A majority of the samples treated (within this subzone) yielded no ostracodes at all. Nine ostracode species have been recorded (including *Acrocythere oeresundensis* and *Cytheropteron? cavatum* found at the upper boundary in Rydebäck-Fortuna No. 1 drill-core). Most of these are restricted to Skåne and the Danish Embayment (6 species), but two species are also represented in Germany and one in France at a corresponding stratigraphic level.

The entire thickness of the middle subzone is estimated to 55 m in Katslösa No. 620 well-cutting and to 51 m in the Pankarp-Strövelstorp No. 334 drill-core.

No ammonites have been recorded from the subzone. Hilterman (in Bölau 1959, pp. 186–187), however, found ammonites from strata situated above and below the subzone discussed. In Pankarp-Strövelstorp No. 334 drill-core indications of the *Microderoceras birchi* Subzone are rendered (on fragmentary ammonites) 6 m below and indications of the *Phricodoceras taylori* Subzone are recorded 1 m above the subzone discussed. Reyment (1969a, p. 208) mentions the occurrence of the *Asteroceras obtusum* Zone below the subzone discussed in the Gantofta Brick Pit. Considering all the ammonites recorded from this subzone, it is obvious that the ostracode subzone can be correlated with the *Oxynoticeras oxynotum* and *Echioceras raricostatum* Zones. It is doubtful whether parts of the *A. obtusum* and *Uptonia jamesoni* Zones also could be correlated with this ostracode subzone. Michelsen (1975, pp. 33–34) referred the ostracode subzone discussed to the *A. obtusum, O. oxynotum,* and *E. raricostatum* Zones. Michelsen based this correlation on the occurrence of ammonites as well as ostracodes characteristic of the subzone in question in Germany. Nørvang (1957, p. 313) reports the occurrence of the ammonite *Psiloceras planicosta,* corresponding to the *A. obtusum* Subzone at 4 500'–4 518' in the Gassum drill-core. This interval is referred to the lower part of the ostracode subzone discussed.

The upper subzone of the *Ogmoconchella danica* Zone, the *Gramannella apostolescui–Kinkelinella foveolata* Subzone, was defined by Michelsen (1975, pp. 34–38). In the Danish Embayment it is characterized by the occurrence of *K. foveolata, G. apostolescui, G. laevigata, O. danica,*

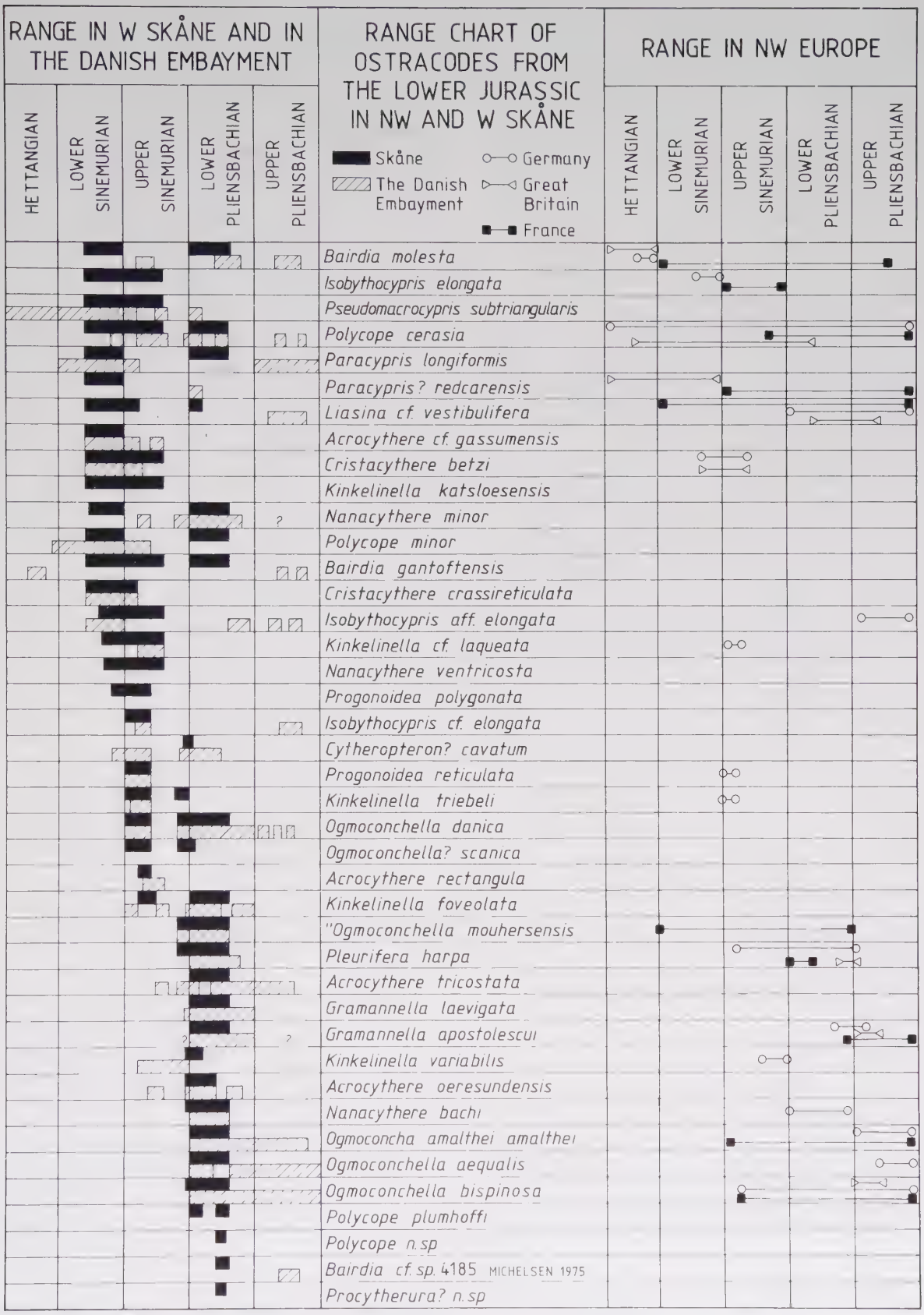


Fig. 3. Range chart of ostracodes from the Lower Jurassic in northwest and west Skåne compared with ranges of the same species in the Danish Embayment (after Michelsen 1975) and other parts of NW Europe (cf. description of respective species for references).

Pleurifera harpa, and *Nanacythere minor.* These species correspond to the ostracode assemblage recorded in the present investigation. In the present investigation the lower boundary of the subzone is drawn at the first occurrence of representatives of one or more of the following ostracode species: *G. apostolescui, G. laevigata, Ogmoconcha amalthei amalthei,* and *P. harpa.* These species have been chosen as they are common in this subzone in Skåne. The upper boundary of the subzone is not distinguishable in the present profiles.

The subzone contains a rich ostracode fauna, the richest recorded in the Lower Jurassic of Skåne. Twenty-five ostracode species have been recorded, two of which are described as new. There are usually one to four species represented in each sample. Several samples have yielded five to eight species, and a maximum of nine species was recorded in one sample. Of the species obtained sixteen were recorded at a corresponding stratigraphic level in the Danish Embayment, six in Germany, two in England and seven in France.

Michelsen referred this subzone to the entire Lower Pliensbachian. The ostracode evidence is the occurrence of *Monoceratina amlingstadtensis, Nanacythere bachi* or *Trachycythere horrida* within the subzone in the Gassum drill-core. These species are restricted to the Lower Pliensbachian in Germany. *M. amlingstadtensis* and *T. horrida* have not been recorded in Skåne. The ammonite *Androgynoceras capricornus,* representing the *Prodactyloceras davoei* Zone was reported by Nørvang (1957, p. 313) from the ostracode subzone in the Gassum drill-core, a fact which supports the referring of the discussed subzone to the Lower Pliensbachian.

Two of the present sections have yielded ammonites viz. the Katslösa section and Pankarp-Strövelstorp No. 334 drill-core. There is evidence of the *Phricodoceras taylori* Subzone of the *Uptonia jamesoni* Zone in the above mentioned boring, rendered by Hilterman (in Bölau 1959, p. 187). This observation was made at 41.0 m, at the base of the *G. apostolescui–K. foveolata* Subzone. Troedsson (1951, p. 77) reports the occurrence of the ammonite *Uptonia jamesoni* in the Katslösa section, thus indicating the presence of the *U. jamesoni* Zone. However, the ammonite specimens on which the determination is based are poorly preserved and therefore questionable. Both these ammonite records confirm the statement by Michelsen that the subzone discussed should be referred to the Lower Pliensbachian.

Regional conditions

In the Late Triassic and Early Jurassic northern Europe was subjected to transgressions.

In western Skåne the Triassic Kågeröd Formation (mainly terrestrial) is succeeded by the Rhaetic Vallåkra and "Mine" beds and the Hettangian Helsingborg Member, together forming the Höganäs Formation (Norling, personal communication 1979). This formation was mainly formed in a non-marine environment with occasional marine ingressions.

As the transgression advanced, the marine influence increased and became dominating during the remaining part of the Early Jurassic. The Döshult, Pankarp, Katslösa, and Rydebäck Members of the Rya Formation were formed. The marine influence decreased at the end of the Early Jurassic (at the time when the Rydebäck Member was formed).

During the Early Jurassic the position of Skåne was around 40° N (Göran Bylund in Lund, personal communication 1979), a latitude which corresponds to the position of the Mediterranean in present times. The present latitude of Skåne is around 56° N.

In Middle Jurassic times the North Sea region was characterized by a regression when littoral and deltaic sediments were formed (Michelsen 1978, p. 16). In Skåne the Middle Jurassic Vilhelmsfält Formation was formed in a limnic environment.

The Lower Jurassic sediments of western Skåne were formed at the eastern margin of the Danish Embayment. The areal extension of the Danish Embayment (the Danish Sub-basin) was shown by Michelsen (1978b, Fig. 1) and Rasmussen (1978, Figs 1, 2). The marginal sediments, treated in the present paper, are developed somewhat differently from those in the Danish Embayment. Corresponding sediments in the Danish Embayment, viz. the Fjerritslev Formation (Michelsen 1978b, pp. 9–16), are mainly composed of marine claystone and

shale, whereas the sediments of the Rya Formation are more arenaceous. The Fjerritslev Formation has a maximum thickness of 911 m in the central part of the basin, whereas the Rya Formation has a maximum thickness of 400 m in the Helsingborg-Öresund area and 250 m in the Ängelholm-Höganäs area (Norling 1977, p. 455). Michelsen (1978, p. 15) stated that the Fjerritslev Members F-I(b) and F-II correspond to the Pankarp and Katslösa Members of the Rya Formation.

On comparing the Rya Formation with the Fjerritslev Formation, it is obvious that the former was laid down in near-shore environments, while the sediments of the Fjerritslev Formation were deposited in deeper water more distant from the coast.

As the investigated area is situated at the eastern margin of the Danish Embayment, it is natural that there are many ostracode species in common. The vertical ranges in northwest Europe of the ostracodes treated are illustrated in Fig. 3.

Michelsen (1975, pp. 110–115) discussed the connections between various ostracode faunas of northwest Europe. He found that the affinity between the Danish and north German ostracode faunas is high except in the Early Sinemurian. This fact, according to Michelsen, is explained by open sea-way connections between the Danish and the north German basins during the main part of the Early Jurassic. The correlation of the Early Sinemurian faunas (few species in common) is, however, an exception.

The composition in the ostracode fauna of Great Britain and France shows little similarity to that of Skåne and Denmark. The Hettangian and Lower Sinemurian faunas in Great Britain and Denmark form another exception with many species in common. A difference worth noticing may be that representatives of *Cytherella* and *Cytherelloidea* are frequently recorded in France and Great Britain, while none of these genera have been recorded from northern Germany, the Danish Embayment or Skåne.

Two ostracode zones are recorded in Skåne, the *Cristacythere betzi–C. crassireticulata* Zone and the *Ogmoconchella danica* Zone. The most frequent species in the *Cristacythere betzi–C. crassireticulata* Zone is *C. betzi*. This species is also reported from the Danish Embayment, Great Britain and Germany. The dominating species of the lower part of the *O. danica* Zone is *O. danica*. The dominating species in the upper part are *Ogmoconcha amalthei amalthei, Pleurifera harpa, Gramannella apostolescui, "Ogmoconchella" mouhersensis,* and *O. danica*. All these species are recorded from the Danish Embayment and most of them are also reported from the rest of northwest Europe. *O. danica,* however, seems to be restricted to the Danish Embayment and Skåne.

When comparing the investigated fauna with those of other parts of northwest Europe it has not been possible to draw any further conclusions regarding connections between them. A striking feature is, however, that the most important and frequent species recorded in Skåne are also widespread in northwest Europe.

Material

The present material originates from borings and outcrops mainly situated in northwest Skåne (Fig. 1). Material from fourteen borings and four outcrops has been examined. The material from borings consists of core samples and well-cuttings.

All samples investigated are marked with a bar in the column for "sample levels and Nos" in the well and outcrop logs. A sample yielding ostracode specimen is marked with a number.

The illustrated specimens are stored in the original collection of the Geological Survey of Sweden (SGU), Uppsala, Sweden.

Subsurface material

The examined drill-cores and well-cuttings are from borings penetrating Pleistocene, Middle Jurassic and Lower Jurassic beds. The present investigation is concentrated on Lower Jurassic strata (Lias).

Most of the borings (ten) were drilled by, and belong to, the Höganäs Company. The borings were carried out as part of their coal and fire-clay prospecting program. That material is stored by the Höganäs Company, Bjuv, the remaining four borings are stored by the Geological Survey of Sweden, Uppsala.

The material from the Höganäs Company borings was examined by the company's geologists immediately after the drillings were carried out. The penetrated strata were divided and numbered on lithological grounds from top to bottom. Each bed was numbered and sampled. Approximately 300 g of each sample was then stored and the rest of the material was thrown away. The number given to a particular bed was used for the corresponding sample in this investigation. The amount of material treated is restricted to a maximum of 100 grammes per sample.

The material from the Geological Survey borings is also restricted to a maximum of 100 grammes per sample, the core diameter being only 42 or 32 mm. The Kävlinge boring material was treated by the late Dr F. Brotzen and the ostracodes from it are stored at the Swedish Museum of Natural History, Stockholm.

The borings carried out by the Geological Survey are all core drillings whereas those of the Höganäs Company are both core drillings and cable tool drillings.

The cable tool drillings have been carried out in two ways:

I. Some 10 to 15 cm of the sequence were penetrated by a 4 1/2″ cut. The sequence was then sampled by a special "sampling cut", 6″ in diameter, with a holder hanging in a chain immediately below the cut. The material which is then cut out falls down into the holder and can easily be taken out from the hole. Even very thin horizons, some cm, can be sampled in this way.

II. A barrel, 3″ in diameter, is pressed down through the sediment 10 to 75 cm depending on the composition and lithification of the sediment. The barrel is then withdrawn and the sediment plug can be taken out of it. Then the hole is widened to 6″ and the procedure is repeated.

It is not possible to judge either from the material or from the protocol, which of the two methods was used.

Surface material

The Gantofta material, as well as the material from locality No. 66 of Troedsson, has been sampled by me. The material from Örby was placed at my disposal by Dr E. Norling. Material from the Katslösa section was lent from the Swedish Museum of Natural History, Stockholm, where that material is stored. It was examined by the late Dr F. Brotzen. The Katslösa section and the Örby exposure are no longer visible.

Laboratory methods

Some 100 grammes of each sample were crushed to pieces, dried (105° C, 24 hours) and petrol was added. After 24 hours in petrol, boiling water was added. The samples were then siefted through a sieve (71 μm) in gently running water. The residues were then dried and the ostracodes picked out and sorted from fractions larger than 0.1 mm. The method is that of Ferguson (1965) and Sivhed (1977, p. 5). The specimens were then treated for scanning electron microscopy according to established methods.

Description of the sections

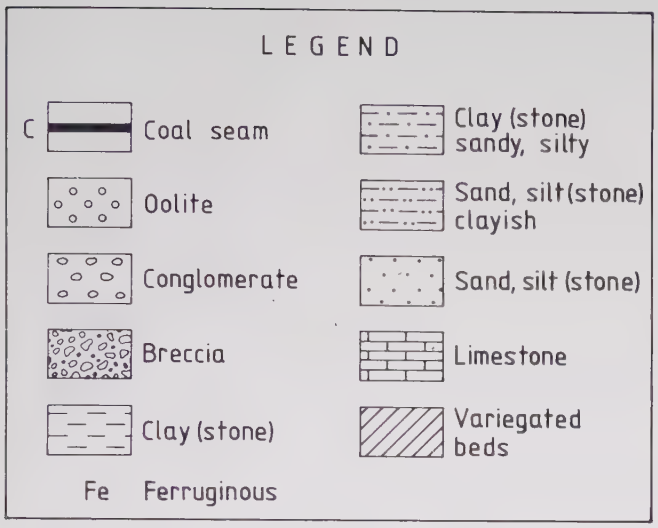


Fig. 4. Lithostratigraphic legend for the sections described in Figs. 5–21.

Pankarp-Strövelstorp No. 334 boring

Fig. 5

Location: About 1 600 m WNW of Strövelstorp church.
Maps: Topographical map sheet 3C Helsingborg NV, Geological map sheet Aa No. 76, Ae No. 25.
UTM co-ordinates: UC 6420 2658.
Elevation: 8.30 m a.s.l.
Drilling: Spudded August 6, completed November 27, 1954.
Drilling method: Core drilling.
Total depth: 187.90 m.
Core diameter: 16.60–47.50 m 203 mm, 47.50–187.90 m 153 mm.
Stratigraphic range: The Helsingborg Member 187.90–183.10 m; the Döshult Member 183.10–103.00 m; the Pankarp Member 103.00–45.70 m; the Katslösa Member 45.70–16.60; Pleistocene 16.60–0 m.

The boring was carried out by the Höganäs Company. The core sequences were described by Bölau (1959, pp. 178–179, 181–183, 186–188, Fig. 2; 1973, pp. 268–272, Fig. 1) and Norling (1972, pp. 9–10, Fig. 2).

Bölau (1959, pp. 181–183) described the penetrated strata from lithologic and biostratigraphic points of view. The same lithostratigraphic units as established by him have been recognized by me. Bölau drew no distinct boundary between the Katslösa Member and the Pankarp Member, or a boundary between the Pankarp Member and the Döshult Member. He used the term "Übergangsschichten" (transition beds) for the beds on the boundary.

DÖSHULT MEMBER

Lithology.–At its base the Döshult Member is composed of sandstone and sandstone crossbedded with dark claystone. In the middle part there is a sandstone with subordinated bands of dark grey claystone. At 158–155 m a variegated sandstone occurs.

Biostratigraphy.–Only the upper part of the Döshult Member has yielded ostracodes. Finds of *Ogmoconchella danica* indicate the *O. danica* Zone lower boundary at 120 m. The ostracode zone directly below the *O. danica* Zone, is the *Cristacythere betzi–C. crassireticulata* Zone. One of the zonal denominators of this zone, *C. betzi,* has been recorded in the *O. danica* Zone in this drill-core, but neither of the two index fossils of the *C. betzi–C. crassireticulata* Zone has been recorded below the *O. danica* Zone in this drill-core. However, some accessory species of the *C. betzi–C. crassireticulata* Zone are recorded, viz. *Progonoidea polygonata, Nanacythere ventricosta, Polycope minor,* and *Pseudomacrocypris subtriangularis.* The problem is that both *Polycope minor* and *Pseudomacrocypris subtriangularis* are accessory species of the underlying *O. aspinata* Zone (Michelsen 1975, p. 21). In my opinion, however, the ostracode yielding part of the Döshult Member below the first occurrence of *O. danica* should be referred to the *C. betzi–C. crassireticulata* Zone (134.50–120.00 m).

At 123.5–123.3 m Bölau (1959, p. 187) recorded finds of ammonites, bivalves and gastropods. The ammonites included *Arnioceras* cf. *pseudokridion* SPATH and *A. falcaries* (QUENSTEDT). *A. pseudokridion* indicates the *Scipionianum* Subzone, the middle subzone of the *A. semicostatum* Zone, Lower Sinemurian.

PANKARP MEMBER

Lithology.–The basal part of the Pankarp Member consists of variegated claystone. Bölau (1959) included a sequence (1 m thick) of grey, somewhat sandy, claystone in the lowermost part of the Pankarp Member. I have included that sequence in the underlying Döshult Member.

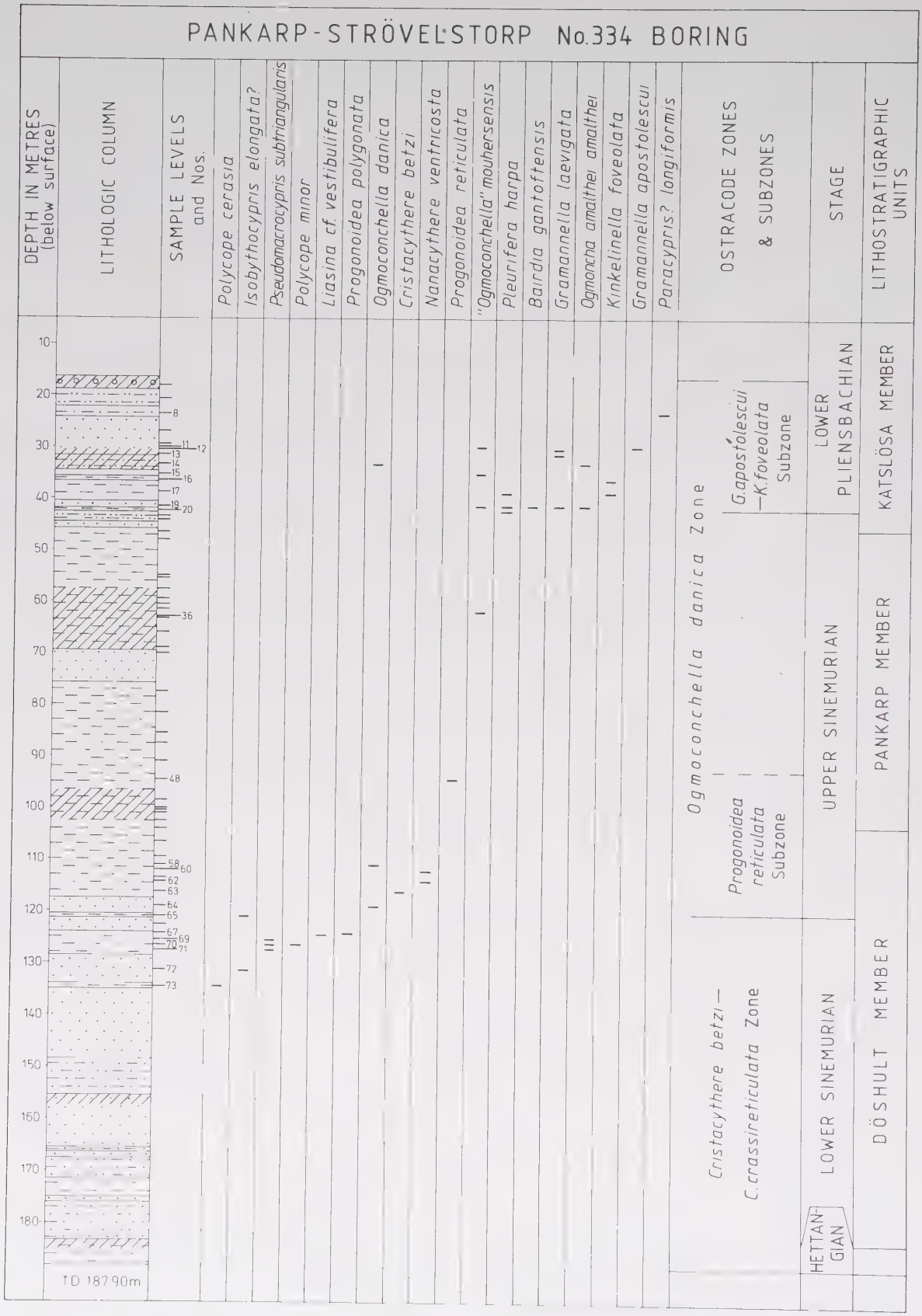


Fig. 5. Well log of the Pankarp-Strövelstorp No. 334 boring.

The variegated claystone is followed by a grey claystone overlain by a sandstone with coal remains. The uppermost part of the Pankarp Member is made up of greyish coloured clay with numerous thin sandy layers.

Biostratigraphy.–The Pankarp Member has yielded two ostracode species, viz. *Progonoidea reticulata* in its lower part and *"Ogmoconchella" mouhersensis* in its upper part. *P. reticulata* is the zonal denominator of the lowermost subzone – the *P. reticulata* Subzone – of the *O. danica* Zone. The presence of *"O." mouhersenis* might indicate the middle subzone of the *O. danica* Zone.

According to Bölau the ammonite *Microderoceras* sp. (cf. *birchi* (Sow.)) is found at 103 m. *M. birchi* indicates the *Caenisites turneri* Zone.

KATSLÖSA MEMBER

Lithology.–The sediments of the Katslösa Member consist of sandstone, claystone, ooids, and a breccia at 31.78 m with grey, greyish blue, and greyish green colours. The section between 57.42 and 48.57 m is referred to the Pankarp Member by Bölau (1959, p. 183). However, in my opinion this interval should be referred to the Katslösa Member. I have drawn the boundary between the two members at 45.70 m, directly above the greyish coloured clays constituting the sequence between 57.42–45.70 m. Bölau (1959, p. 181) recorded a sandstone in the uppermost part of the section, 18.95–16.60 m. A sample from that part of the section has been examined by me. I found only iron ooids in an argillaceous matrix.

Biostratigraphy.–The Katslösa Member has yielded ostracodes only in its middle and upper parts. The species found are typical for the *Gramannella apostolescui–Kinkelinella foveolata* Subzone. Bölau (1959, pp. 186–187) found belemnites, bivalves and ammonites at 41.00 m and belemnites at 30.34 m, which would indicate the *Phricodoceras taylori* Subzone of the *Uptonia jamesoni* Zone (ammonite zonation).

Pankarp-Strövelstorp No. 336 boring

Fig. 6

Location: 1 850 m W of Strövelstorp church.
Maps: Topographical map sheet 3C Helsingborg NV, Geological map sheet Aa No. 76, Ae No. 25.
UTM co-ordinates: UC 6397 2586.
Elevation: 8.85 m a.s.l.
Drilling: Spudded December 21, 1954, completed February 18, 1955.
Total depth: 76.60 m.
Core diameter: 15.00–45.70 m 203 mm, 45.70–76.60 m 152 mm.
Stratigraphic range: The Pankarp Member 76.60–37.30 m; the Katslösa Member 37.30–15.00 m; Pleistocene 15–0 m.

The boring was carried out by the Höganäs Company.

PANKARP MEMBER

Lithology.–The Pankarp Member is made up of a greyish green clay in its lower part (76.60–73.40 m). Its upper part is made up of a variegated (58.35–46.10 m) and a grey (46.10–37.30 m) clay. The sequences between 73.40–58.35 m and 52.88–52.60 m are made up of grey sandstone, calcareous between 73.40 and 73.10 m. Coal fragments are also found in that interval. The core recovery is only about 35% in the sandy parts.

Biostratigraphy.–In the sequence referred to the Pankarp Member only one ostracode specimen was found, viz. a specimen of *Ogmoconchella danica*.

KATSLÖSA MEMBER

Lithology.–The Katslösa Member is basally (37.30–35.40 m) made up of a sandstone. This sandstone is overlain by a grey, somewhat sandy claystone (35.40–28.40 m). The sequence between 28.40 and 23.30 m consists of a greyish sandstone, argillaceous in its upper part. The upper part of the section is composed of a greyish-green sandstone (23.30–17.60 m) overlain by a dark grey clay (17.60–15.00 m).

Biostratigraphy.–The penetrated sequence has yielded an ostracode fauna representative of the upper subzone, the *Gramannella laevigata–Kinkelinella foveolata* Subzone. The recorded specimens typical for that subzone are i.a. *G. apostolescui, Ogmoconcha amalthei amalthei, Pleurifera harpa* and Ogmoconchella bispinosa.

Gantofta No. 358 boring

Fig. 7

Location: About 10 km SE of Helsingborg centre.
Maps: Topographical map sheet 3C Helsingborg SV. Geological map sheet Aa No. 74, Ae No. 16.
UTM co-ordinates: UC 6325 0630.
Elevation: 30.23 m a.s.l.
Drilling: Spudded January 16, completed March 30, 1961.
Drilling method: Core drilling.
Total depth: 163.30 m.
Core diameter: 1.30–59.30 m 116 mm, 59.30–162.20 m 101 mm.
Dip: 162.30–1.30 m 15°.
Stratigraphic range: The Helsingborg Member–the Döshult Member 162.30–44.14 m; the Pankarp Member 44.14–1.30 m; Pleistocene 1.30–0 m.

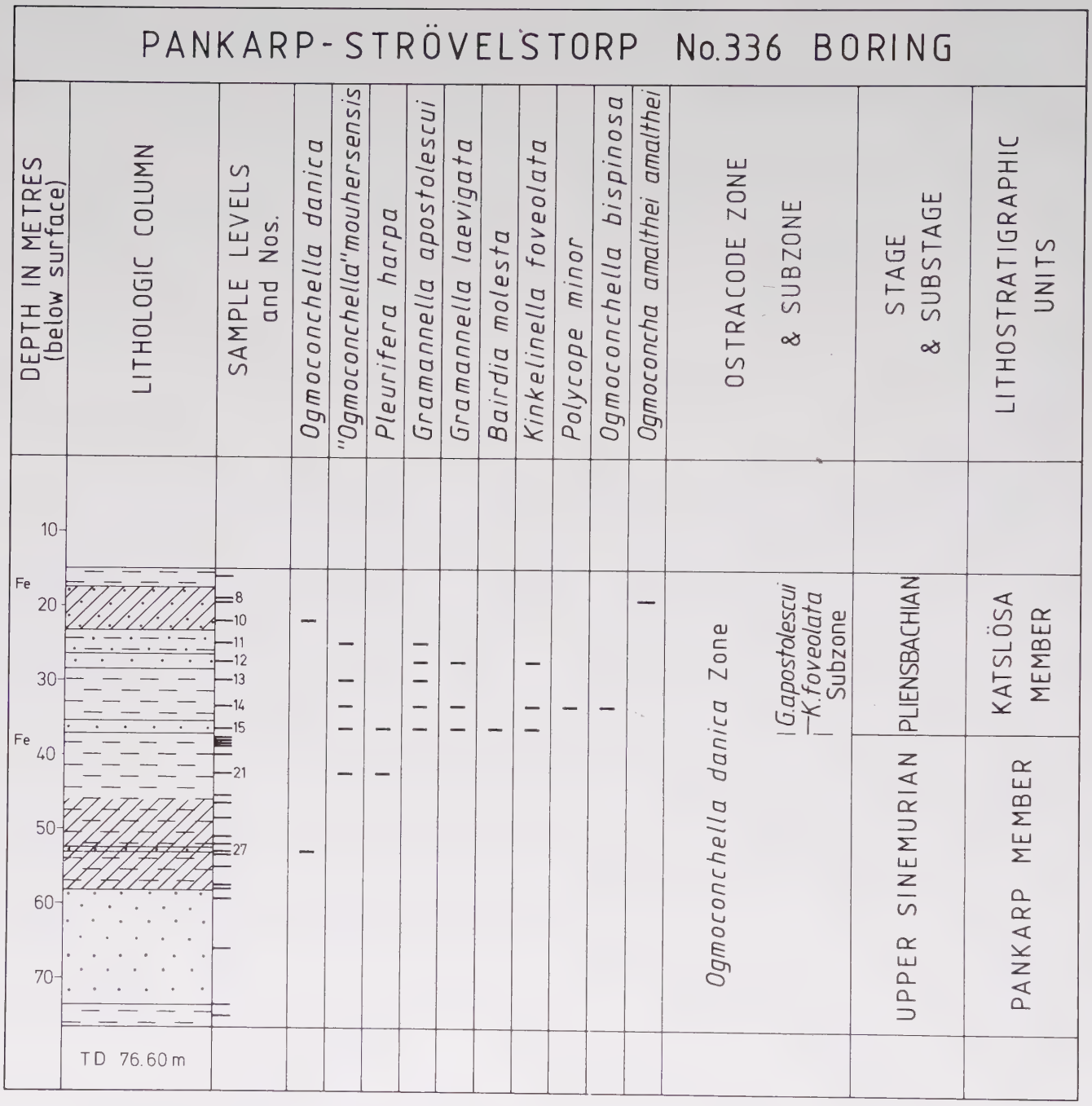


Fig. 6. Well log of the Pankarp-Strövelstorp No. 336 boring.

The boring was made by the Höganäs Company.

HELSINGBORG MEMBER

Lithology.–The sequence between 162.30 and 87.30 m was tentatively referred to the Helsingborg Member. The main part (141.00–83.70 m) of that section consists of a sandy, dark grey claystone, while the lower section (162.30–141.00 m) is dominated by a fine grained sandstone with numerous thin, dark argillaceous beds. A breccia was penetrated at 155.80 to 148.55 m.

Biostratigraphy.–No fossils were found in the Helsingborg Member.

DÖSHULT MEMBER

Lithology.–The sequence between 87.30 and 44.14 m is referred to the Döshult Member. It consists in its lower part of a sandstone with argillaceous beds and in its upper part of a grey to dark grey clay. A breccia is present at 58 m.

Biostratigraphy.–The ostracode fauna obtained from the section is restricted to the grey clays in the interval between 60.70 and 51.50 m. The species recorded, *Ogmoconchella danica, Kinkelinella foveolata* and *Nanacythere ventricosta* indicate the *Progonoidea reticulata* Subzone. No representatives of the underlying ostracode zone, the *Cristacythere betzi–C. crassireticulata* Zone, have been recorded. The breccia at 58 m suggests tectonic activity, which could account for the absence of sediment referred to the *C. betzi–C. crassireticulata* Zone.

PANKARP MEMBER

Lithology.–The Pankarp Member is in its lower and middle parts (44.14–15.60 m) composed of variegated clays. The sequence between 15.60 and 1.30 m consists of grey clays mixed with sand including a thin coal seam at 2.30 m.

Biostratigraphy.–No fossils were found in the Pankarp Member.

Gantofta No. 359 boring

Fig. 8

Location: About 10 km SE of Helsingborg centre.
Maps: Topographical map sheet 3C Helsingborg SV, Geological map sheets Aa No. 74, Ae No. 16.
UTM co-ordinates: UC 6335 0635.
Elevation: 35.05 m a.s.l.
Drilling: Spudded May 23, completed June 30, 1961.
Drilling method: Core drilling.
Total depth: 117.00 m.
Core diameter: 2.60–117.00 m 116 mm.
Dip: 117.00–1.60 m 10°.
Stratigraphic range: The Helsingborg Member 117.00–92.75 m; the Döshult Member 92.75–1.60 m; Pleistocene 1.60–0 m.

The boring was carried out by the Höganäs Company.

HELSINGBORG MEMBER

Lithology.–The Helsingborg Member is basally composed of dark shale and sandstone (117.00–92.75 m) overlain by a fairly homogenous succession of light-grey sandstone.

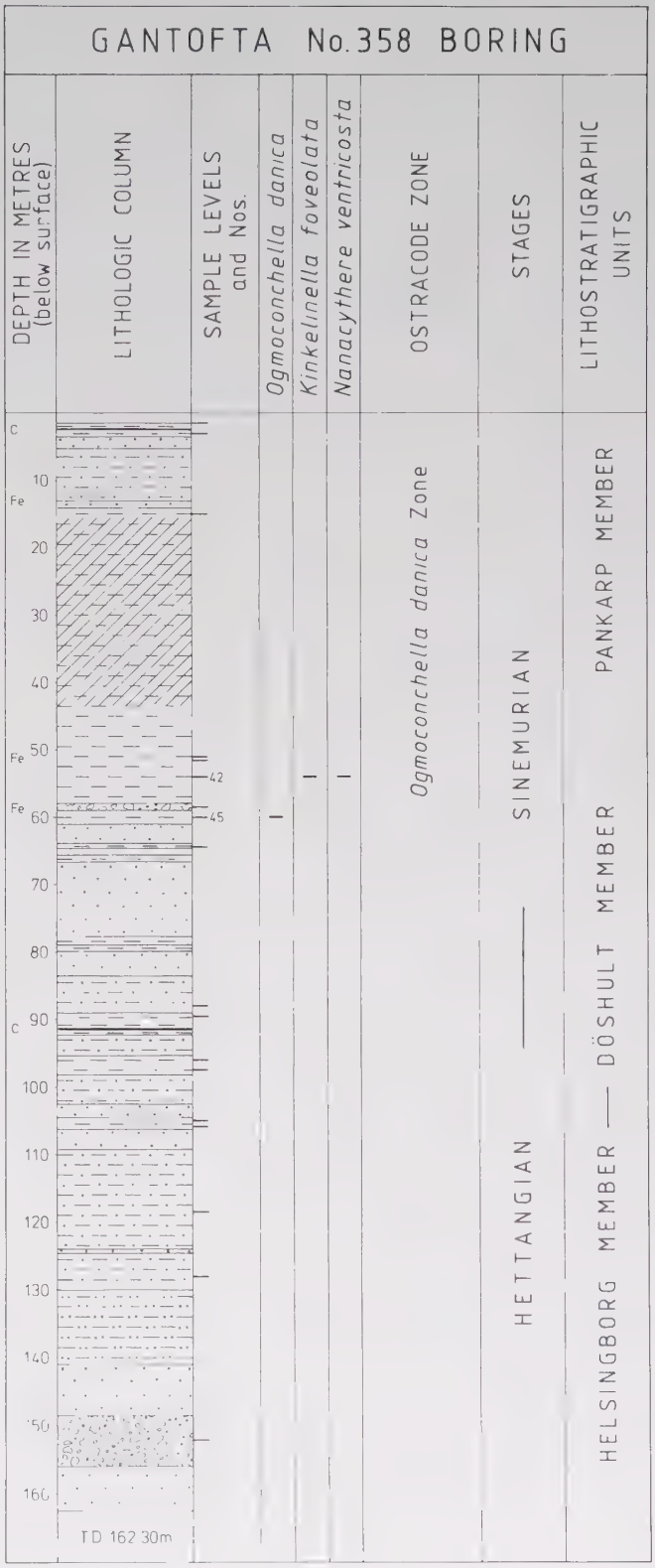


Fig. 7. Well log of the Gantofta No. 358 boring.

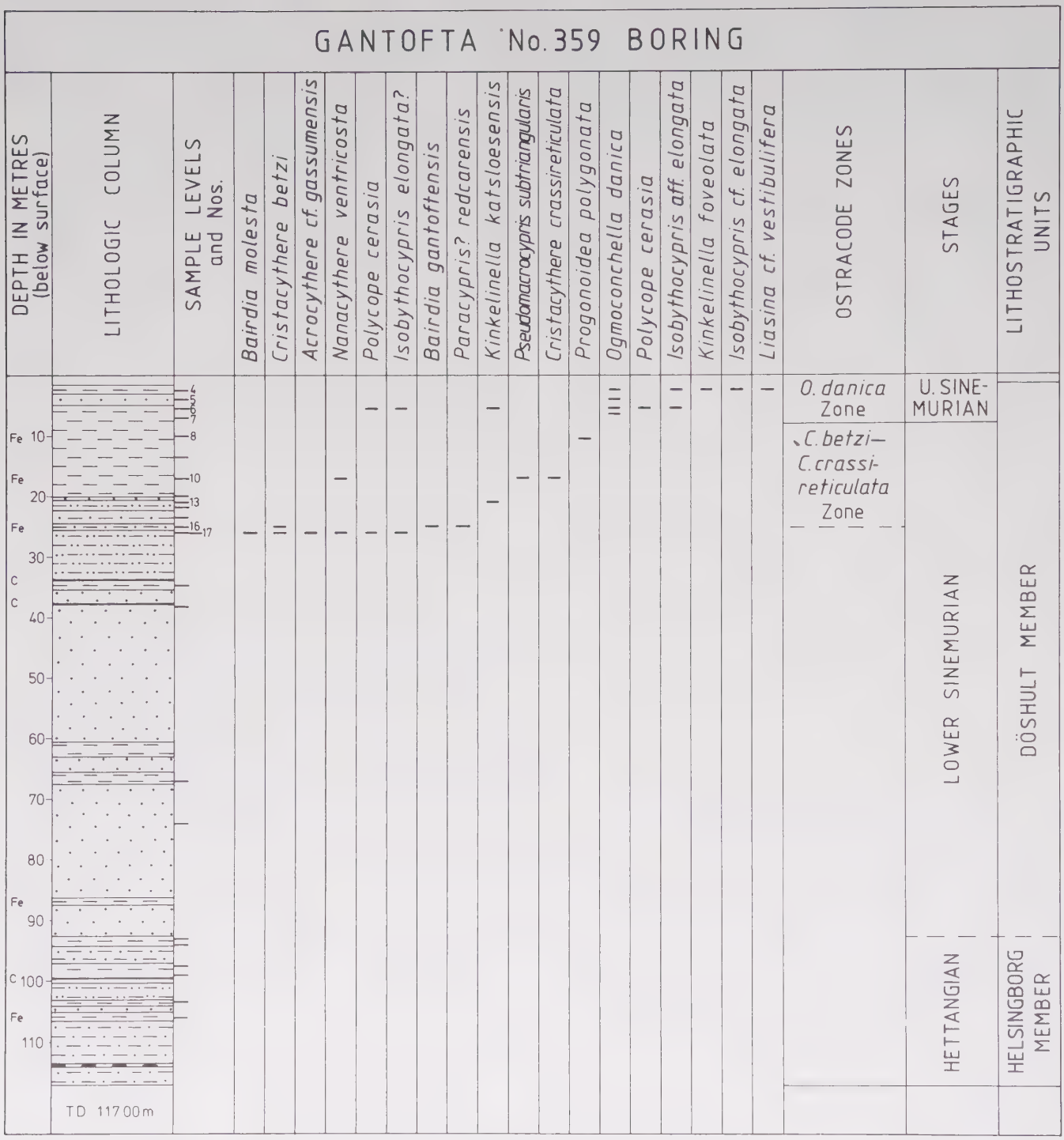


Fig. 8. Well log of the Gantofta No. 359 boring.

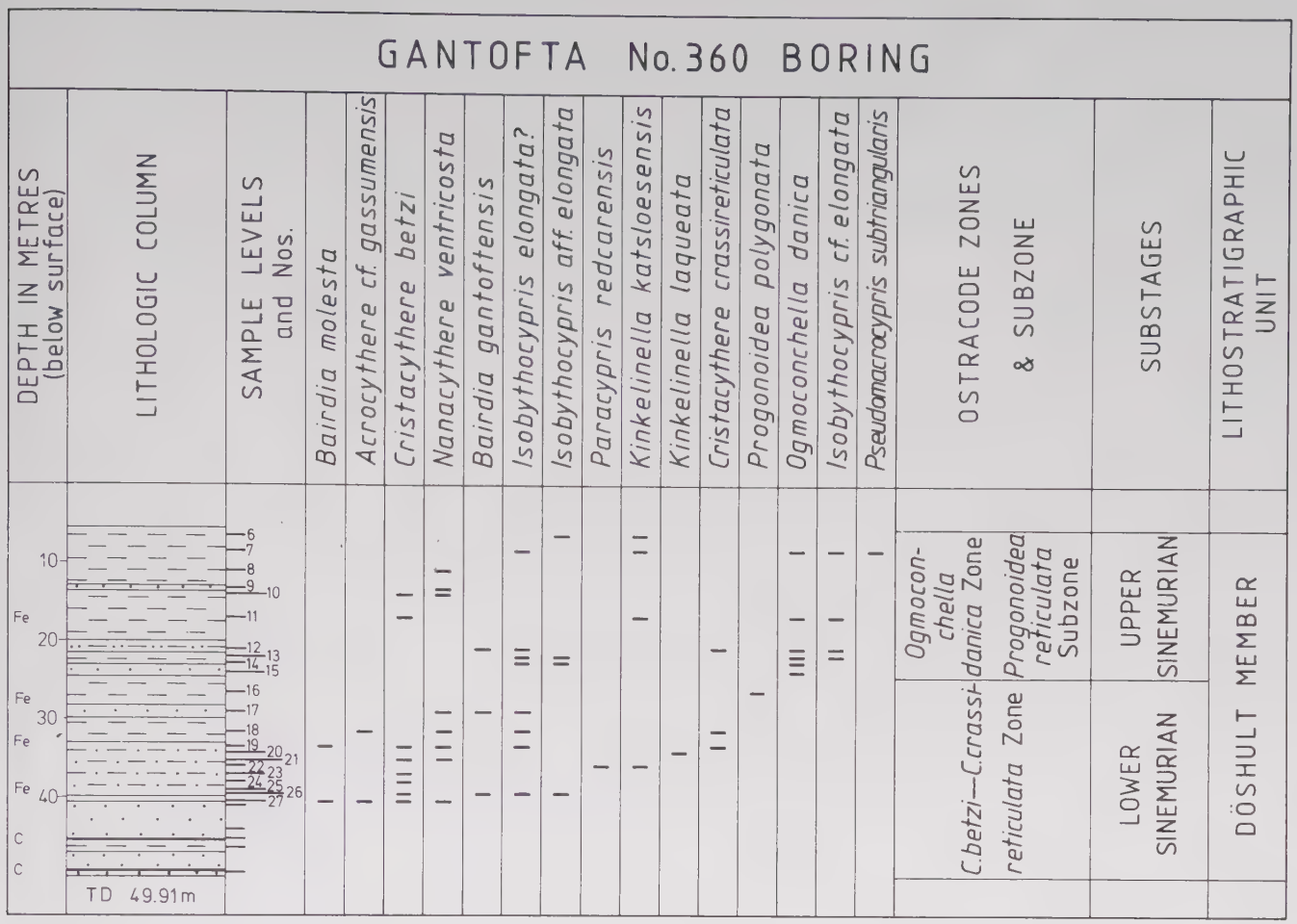


Fig. 9. Well log of the Gantofta No. 360 boring.

Biostratigraphy.–No fossils were found in the Helsingborg Member.

DÖSHULT MEMBER

Lithology.–The Döshult Member consists of a light-grey, fine grained sandstone with a few argillaceous beds in its lower and middle parts. The upper part of the section is made up of a dark shale, arenaceous in its lower part and with two coal seams basally.

Biostratigraphy.–Ostracodes were found only in the upper part of the penetrated sequence, 26.00–1.60 m. Two ostracode zones were distinguished, viz. the *Cristacythere betzi–C. crassireticulata* Zone and the lower part of the *Ogmoconchella danica* Zone. The boundary between these two zones, at 8.00 m, is drawn directly below the lowest bed yielding specimens of *O. danica*.

Gantofta No. 360 boring
Fig. 9

Location: About 10 km SE of Helsingborg centre.
Maps: Topographical map sheet 3C Helsingborg SV, Geological map sheet Aa No. 74, Ae No. 16.
UTM co-ordinates: UC 6315 0635.
Elevation: 30.50 m a.s.l.
Drilling: Spudded August 23, completed September 6, 1961.
Drilling method: Core drilling.
Total depth: 49.91 m.
Core diameter: 2.00–9.20 m 72 mm, 9.20–49.91 m 62 mm.
Dip: 49.91–2.00 m 10°
Stratigraphic range: The Döshult Member 49.91–5.65 m; Pleistocene 5.65–0 m.

The boring was carried out by the Höganäs Company.

DÖSHULT MEMBER

Lithology.–The lithology of the penetrated sequence is that characteristic of the Döshult Member. The Lower part of the section is dominated by sandstone with an increasing argillaceous content upwards. Two thin coal seams were penetrated in the basal part of the section. The upper part of the section is dominated by a dark grey claystone.

Biostratigraphy.–The ostracode fauna obtained in the section clearly indicates the *Cristacythere betzi–C. crassireticulata* Zone and the lower part of the *Ogmoconchella danica* Zone. The boundary between these two zones may be drawn at 24.30 m, directly below the lowest bed yielding specimens of *O. danica*. This boundary corresponds to the boundary between the Lower and Upper Sinemurian.

Nyhus No. 366 boring

Fig. 10

Location: C. 2.4 km SE of Viken church.
Maps: Topographical map sheet Helsingborg 3C NV, Geological map sheet Aa No. 76, Ae No. 25.
UTM co-ordinates: UC 5140 2420.
Elevation: 10.26 m a.s.l.
Core diameter: 2.10–19.80 m 85 mm, 19.80–50.20 m 75 mm, 50.20–69.45 m 65 mm.
Total depth: 69.45 m.
Dip: 20°.
Drilling: Spudded October 17, completed November 2, 1962.
Drilling method: Core drilling.
Stratigraphic range: The Döshult Member 69.45–17.83 m; the Pankarp Member 17.83–0.80 m; Pleistocene 0.80–0 m.

The boring was made by the Höganäs Company. Bölau (1973, p. 271, Fig. 3) described the boring and referred the whole sequence to the Upper Sinemurian, except for the uppermost 2–3 m of rock which he tentatively referred to the Lower Pliensbachian. Bölau based his division on lithologic characteristics.

DÖSHULT MEMBER

Lithology.–The sediments of the Döshult Member (69.45–17.83 m) consist mainly of sandstone. However, the section between 52.80 and 45.10 m consists of a dark grey claystone. In this drill-core the composition of the Döshult Member is different from that of other sections. Normally there is a greyish to greyish black claystone, in the uppermost part of the member, resting on a sandstone. The composition of the present sequence could suggest a redeposition of the Döshult sandstone above the dark clay at 52.80–45.10 m.

Biostratigraphy.–No fossils were found in the Döshult Member.

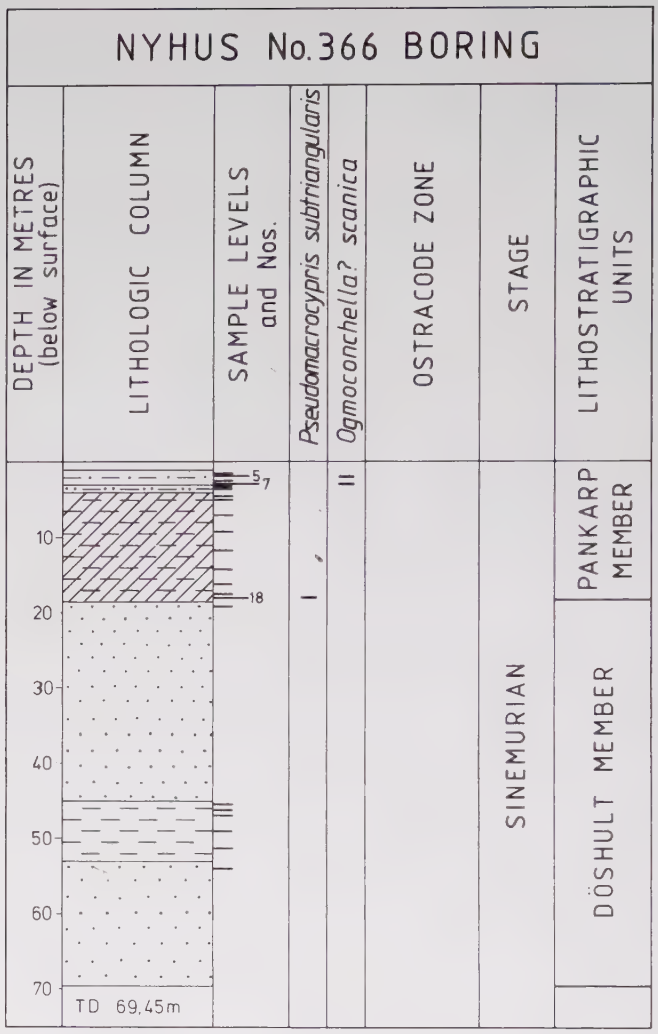


Fig. 10. Well log of the Nyhus No. 366 boring.

PANKARP MEMBER

Lithology.–From a lithological point of view the upper portion of the penetrated strata (17.83–0.80 m) belongs to the Pankarp Member. The variegated clays penetrated are typical of the Pankarp Member. The uppermost part of the section consists of sandy-silty clays. As the middle part of the Pankarp Member consists of sandy-silty layers in other localities, the upper part of the treated section may be correlated tentatively with the Pankarp Member.

Biostratigraphy.–Only a small number of poorly preserved microfossils have been found. Neither the ostracodes nor the foraminifers give any clue for dating the sequence conclusively. The ostracodes range from the Upper Sinemurian to the Lower Pliensbachian in western Europe.

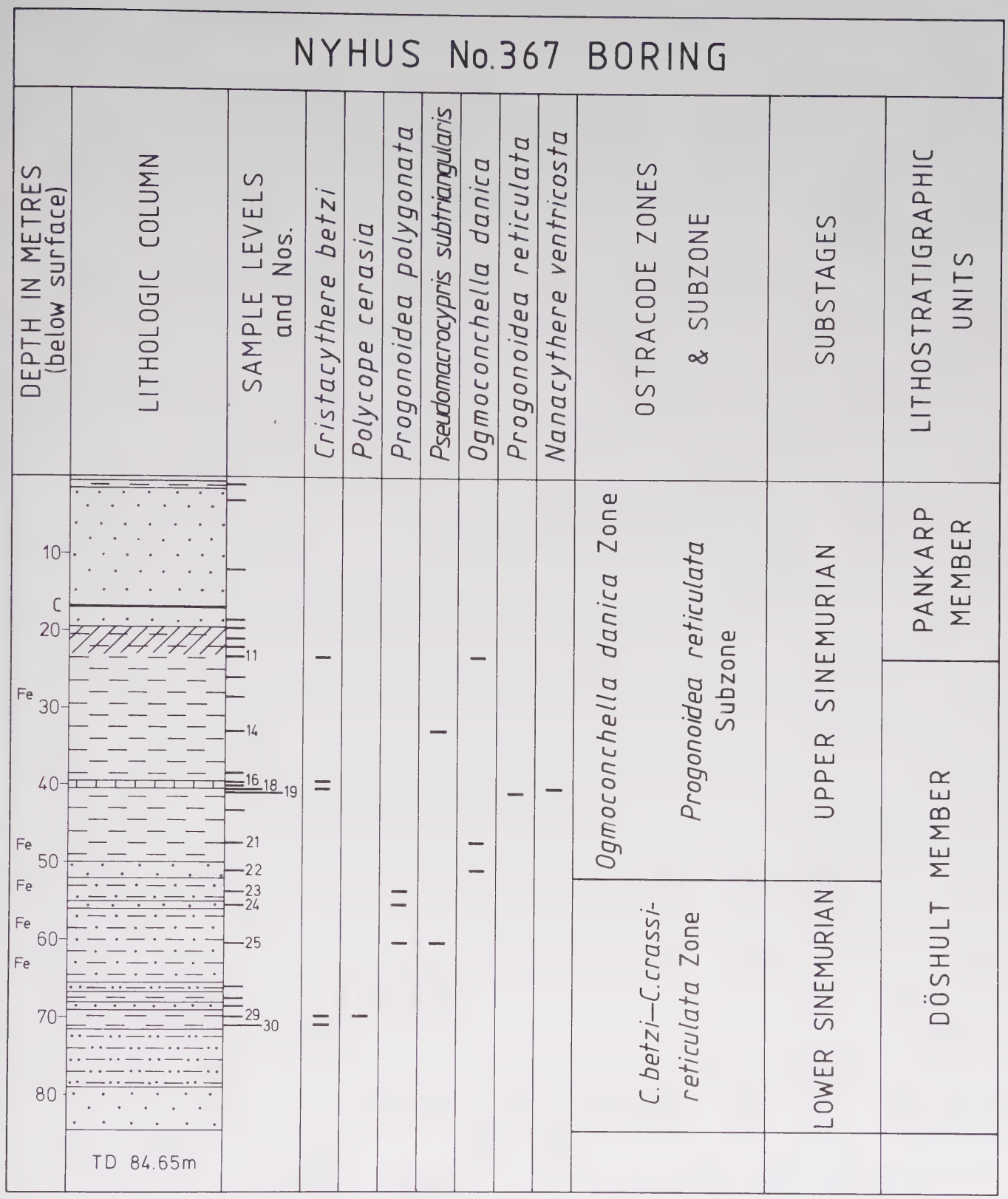


Fig. 11. Well log of the Nyhus No. 367 boring.

Nyhus No. 367 boring
Fig. 11

Location: C. 2 km SE of Viken church.
Maps: Topographical map sheet 3C Helsingborg NV, Geological map sheet Aa No. 76, Ae No. 25.
UTM co-ordinates: UC 5100 2419.
Elevation: 10.14 m a.s.l.
Drilling: Spudded November 8, completed December 12, 1962.
Drilling method: Core drilling.
Total depth: 84.65 m.
Core diameter: 1.80–17.90 m 73 mm, 17.90–52.80 m 62 mm, 52.80–84.65 m 52 mm.
Dip: 5°.
Stratigraphic range: The Döshult Member 84.65–23.20 m; the Pankarp Member 23.20–0.80 m; Pleistocene 0.80–0 m.

The boring was carried out by the Höganäs Company. The sequence penetrated was briefly described by Bölau (1973, Text–Fig. 3). Sivhed & Wallwork (1978, pp. 65–70) reported the find of an oribatid of the still living genus *Hydrozetes* at 40.00–41.05 m. The find represents the oldest oribatid hitherto reported. My interpretation of the sequence essentially follows that of Bölau (1973, Text–Fig. 3).

DÖSHULT MEMBER

Lithology.–Its basal part (84.65–71.60 m) consists of sandstone. The remaining sequence is made up of dark grey shales with a decreasing sandy content downwards in the section. A calcareous sandstone is penetrated at 69 m and a limestone at 40 m.

Biostratigraphy.–The *Cristacythere betzi–C. crassireticulata* Zone is indicated, in the drill-core below the lowermost occurrence of *Ogmoconchella danica* (52.00 m), by specimens of *C. betzi* and *Pseudomacrocypris subtriangularis*. The *Progonoidea reticulata* Subzone (52.00– 23.20 m) is indicated by the ostracodes *P. reticulata* and *O. danica*.

PANKARP MEMBER

Lithology.–The Pankarp Member is basally (23.20–19.25 m) composed of a variegated claystone. This claystone is overlain by a sandstone sequence (19.25–1.65 m) succeeded by a thin grey clay (1.65–0.80 m). There are thin layers of coal in the lower part of the sandstone sequence (19.05–17.40 m).

Biostratigraphy.–No ostracodes were found in the Pankarp Member.

Katslösa No. 620 boring
Fig. 12

Location: About 10 km SE of Helsingborg centre.
Maps: Topographical map sheet 3C Helsingborg SV, Geological map sheet Aa No. 74, Ae No. 16.
UTM co-ordinates: UC 6260 0580.
Elevation: 32.03 m a.s.l.
Drilling: Spudded August 13, completed October 12, 1955.
Drilling method: Cable tool drilling.
Total depth: 138.50 m.
Dip: 138.50–131.50 m 30°, 131.50–79.50 m 10°, 79.50–64.00 m 35–40°, 64.00–31.25 m 10°, 31.25–29.40 m 8°, 29.40–6.40 m 0°.
Stratigraphic range: The Döshult Member 138.50–88.50 m; the Pankarp Member 88.50–26.80 m; the Katslösa Member 26.80–6.40 m; Pleistocene 6.40–0 m.

The boring was carried out by the Höganäs Company and the sequence was described by Bölau (1959, pp. 183–184, Figs 2,5; 1973, Figs 1, 2). He distinguished, on lithologic grounds, Katslösa-, Pankarp-, and Döshult-beds, here regarded as members.

DÖSHULT MEMBER

Lithology. – The Döshult Member consists of dark grey claystone interspersed with sand in the lower part of the sequence (131.50–128.00 m).

Biostratigraphy.–The Döshult Member has yielded a small number of ostracodes viz. *Ogmoconchella danica* and *Acrocythere* cf. *gassumensis*, indicating the lower part of the *O. danica* Zone. However, specimens of *A.* cf. *gassumensis* do also occur in the underlying *Cristacythere betzi–C. crassireticulata* Zone.

PANKARP MEMBER

Lithology.–The Pankarp Member consists of claystone, mainly variegated. In the sandy section in the middle part of the sequence the typical thin (15 cm) coal-seam of the Pankarp Member is found. This sequence is underlain and overlain by grey and variegated clays. A limestone was penetrated at 31 m.

Biostratigraphy.–No ostracodes were found in the Pankarp Member.

KATSLÖSA MEMBER

Lithology.–The sediments of the Katslösa Member consist of sandstone, calcareous claystone, limestone, and argillaceous sandstone. Their colours are grey to dark-grey and subordinated greyish brown and greyish green.

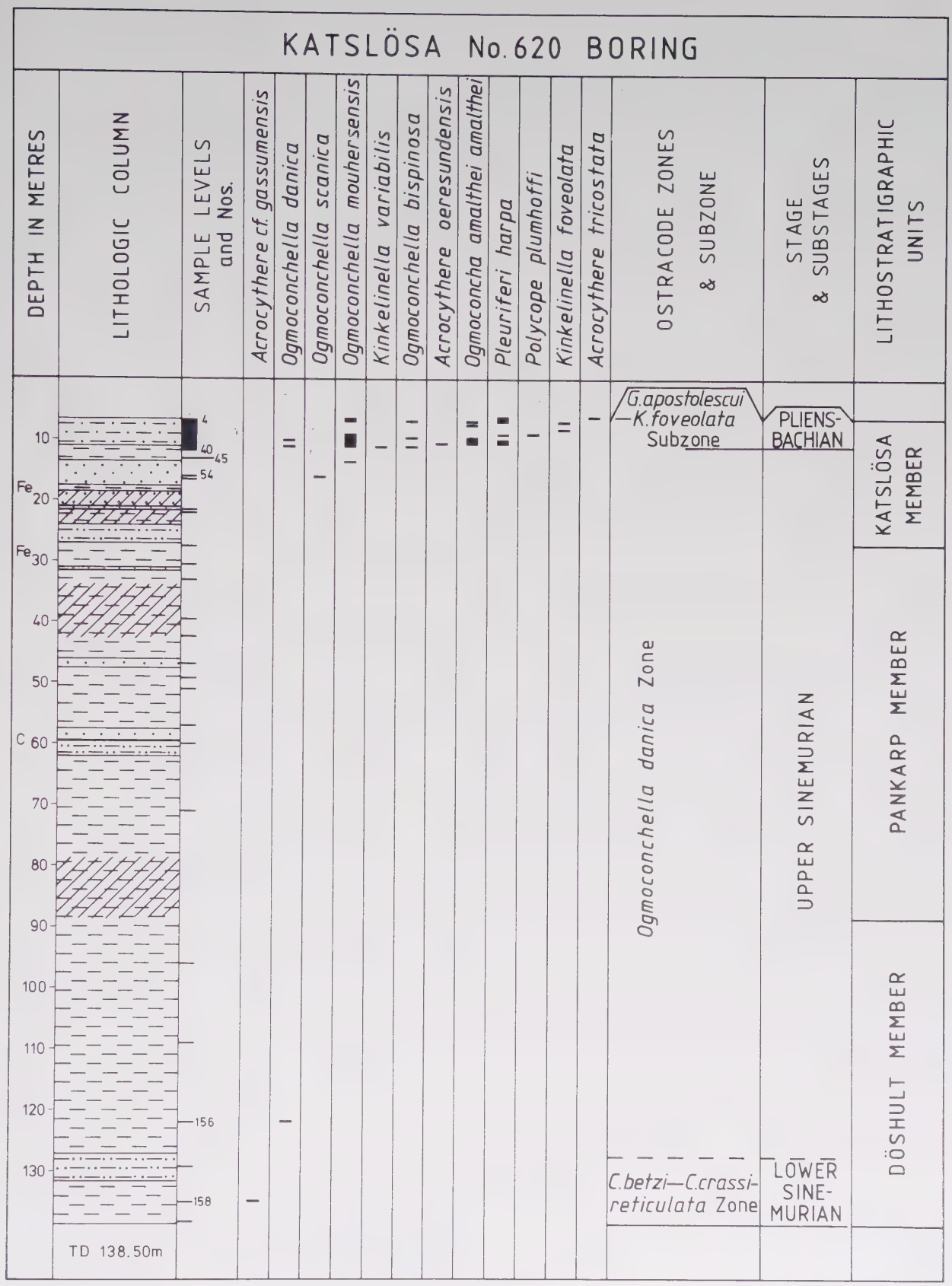


Fig. 12. Well log of the Katslösa No. 620 boring.

Biostratigraphy.–A fairly rich fauna has been obtained from the Katslösa Member. In the upper part of the drill-core the fauna is dominated by foraminifers and ostracodes. A great number of spines from irregular echinoids have also been recorded. Bölau (1959, p. 183) reports the occurrence of belemnites and ammonites in the same part of the section. Only one fossil, a fish tooth, was found in the lower part of the sequence of the Katslösa Member. The ostracode fauna in the Katslösa Member in the present boring is dominated by *"Ogmoconchella" mouhersensis, Ogmoconcha amalthei amalthei* and *Pleurifera harpa*. Also specimens of *Acrocythere oeresundensis, Ogmoconchella danica* and *Kinkelinella variabilis* were found. As specimens of *P. harpa* and *Ogmoconcha amalthei amalthei* are recorded in the uppermost part between 11.00 and 6.40 m, that part of the section is referred to the *Gramannella apostolescui–Kinkelinella foveolata* Subzone. The remaining part of the Katslösa Member is referred to the middle subzone of the *Ogmoconchella danica* Zone.

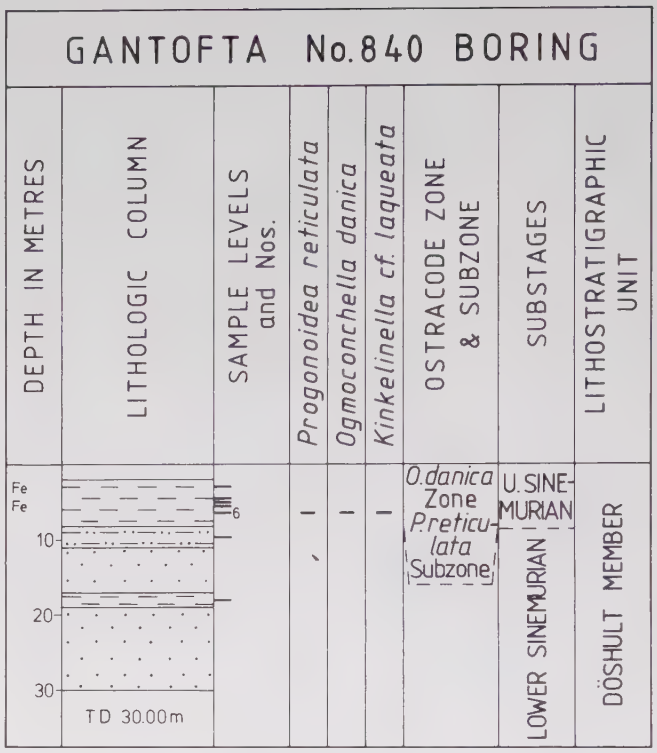


Fig. 13. Well log of the Gantofta No. 840 boring.

Gantofta No. 840 boring
Fig. 13

Location: About 10 km SE of Helsingborg centre.
Maps: Topographical map sheet 3C Helsingborg SV, Geological map sheet Aa No. 74, Ae No. 16.
UTM co-ordinates: UC 6310 0650.
Elevation: 38.14 m a.s.l.
Drilling: Spudded January 4, completed January 12, 1961.
Drilling method: Cable tool drilling.
Total depth: 30.00 m.
Stratigraphic range: The Döshult Member 30.00–2.00 m; Pleistocene 2.00–0 m.

The boring was carried out by the Höganäs Company.

DÖSHULT MEMBER

Lithology.–The sequence between 30.00 and 11.00 m consists of a greyish sandstone with a layer of grey clay at 19.00–17.00 m. The upper part of the section is made up of a dark grey claystone (11.00–2.00 m), sandy in its lower part (11.00–8.30 m).

Biostratigraphy.–Only one sample in the section treated has yielded ostracodes viz. sample No. 6, 8.30–6.50 m. The ostracode fauna in this sample is composed of specimens of *Progonoidea reticulata, Ogmoconchella danica,* and *Kinkelinella laqueata*. These three taxa clearly indicate the *P. reticulata* Subzone.

Gantofta No. 841 boring
Fig. 14

Location: About 10 km southeast of Helsingborg centre.
Maps: Topographical map sheet 3C Helsingborg SV, Geological map sheet Aa No. 74, Ae No. 16.
UTM co-ordinates: UC 6325 0650.
Elevation: 38.15 m a.s.l.
Drilling: Spudded January 18, completed January 24, 1961.
Drilling method: Cable tool drilling.
Total depth: 28.00 m.
Stratigraphic range: The Döshult Member 28.00–4.00 m; Pleistocene 4.00–0 m.

The boring was carried out by the Höganäs Company.

DÖSHULT MEMBER

Lithology.–The lower part of the sequence consists of a grey sandstone (28.00–15.00 m). The upper part of the sequence is made up of a dark grey clay arenaceous in its lower part (15.00–12.20 m).

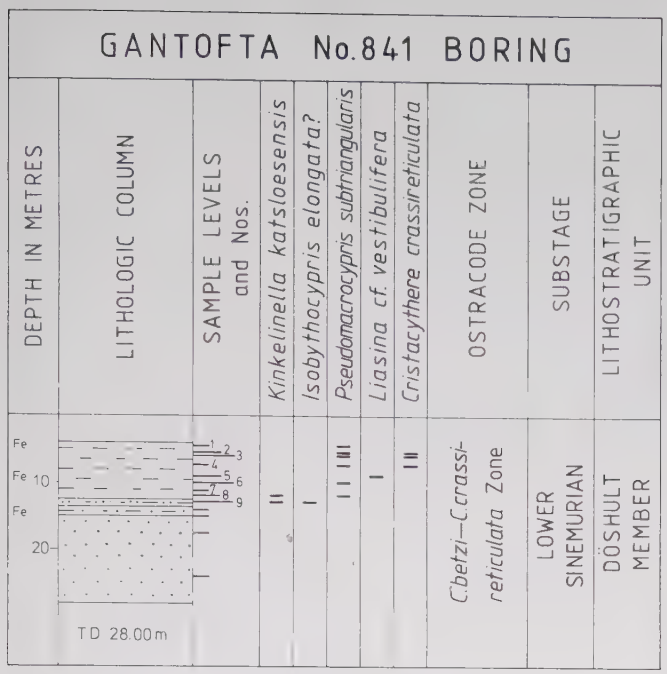


Fig. 14. Well log of the Gantofta No. 841 boring.

Biostratigraphy.–*Cristacythere crassireticulata* and *Pseudomacrocypris subtriangularis* were the only ostracodes found in the section, both are typical representatives of the *C. betzi–C. crassireticulata* Zone. Only the upper part of the sequence (dark grey clay) yielded ostracodes.

Kävlinge No. 930 boring

Fig. 15

Location: On the bank of the Kävlinge river, about 1 700 m SW of Kävlinge church.
Maps: Topographical map sheet 2C Malmö NO, Geological map sheet Aa No. 92, Ad No. 6.
UTM co-ordinates: UB 8000 8314.
Elevation: Less than 5 m a.s.l.
Drilling method: Core drilling.
Total depth: 176 m.
Stratigraphic range: The Döshult Member 176.00–130.00 m; the Pankarp Member 130.00–105.00 m; the Katslösa Member 105.00–29.20 m; Pleistocene 29.20–0 m.

The boring was carried out by the Geological Survey of Sweden. The sequence was described by Norling (1966, pp. 9–10; 1968, p. 12, Text–Fig. 3; 1972, p. 24) and Brotzen & Norling (1966, pp. 13–17).

DÖSHULT MEMBER

Lithology.–The sequence between 176 and 130 m is referred to the Döshult Member on lithologic grounds (Norling 1972, p. 24). The whole sequence consists mainly of sand with a few argillaceous horizons.

Biostratigraphy.–No ostracodes were found in the Döshult Member.

PANKARP MEMBER

Lithology.–The sequence between 130 and 105 m is referred to the Pankarp Member on lithologic grounds (Norling 1972, p. 24). The lower part of the Pankarp Member consists mainly of a sandstone with a grey claystone in its lower part. The upper part of the sequence is made up a grey claystone underlain by a red, c. 9 m thick, claystone. The lithology of this section, 130–105 m, is in many ways equivalent to the sequence of the Pankarp Member in northwest Skåne. The red-brown claystone of the treated section is comparable to the variegated claystone of the Pankarp Member in northwest Skåne.

Biostratigraphy.–No ostracodes were found in the Pankarp Member.

KATSLÖSA MEMBER

Lithology.–The Katslösa Member, 105.00–29.20 m, consists of ferruginous siltstone and claystone.

Biostratigraphy.–The sequence between 89.0 and 29.20 m was referred to the *Gramannella apostolescui–Kinkelinella foveolata* Subzone. However, *G. apostolescui,* one of the index fossils, is lacking in the lower part of the sequence but there are other representatives of the subzone from that part viz. *G. laevigata, K. foveolata, Pleurifera harpa, Ogmoconchella bispinosa,* and *Ogmoconcha amalthei amalthei.*

Norling (1972, p. 24) reported the occurrence of foraminifers, from 103.00–29.20 m, ranging from the Upper Sinemurian to the Upper Pliensbachian, viz. *Marginulina spinata spinata* TERQUEM, *Ichthyolaria mesoliassica* (BRAND), and *Astacolus denticula-carinata* (FRANKE).

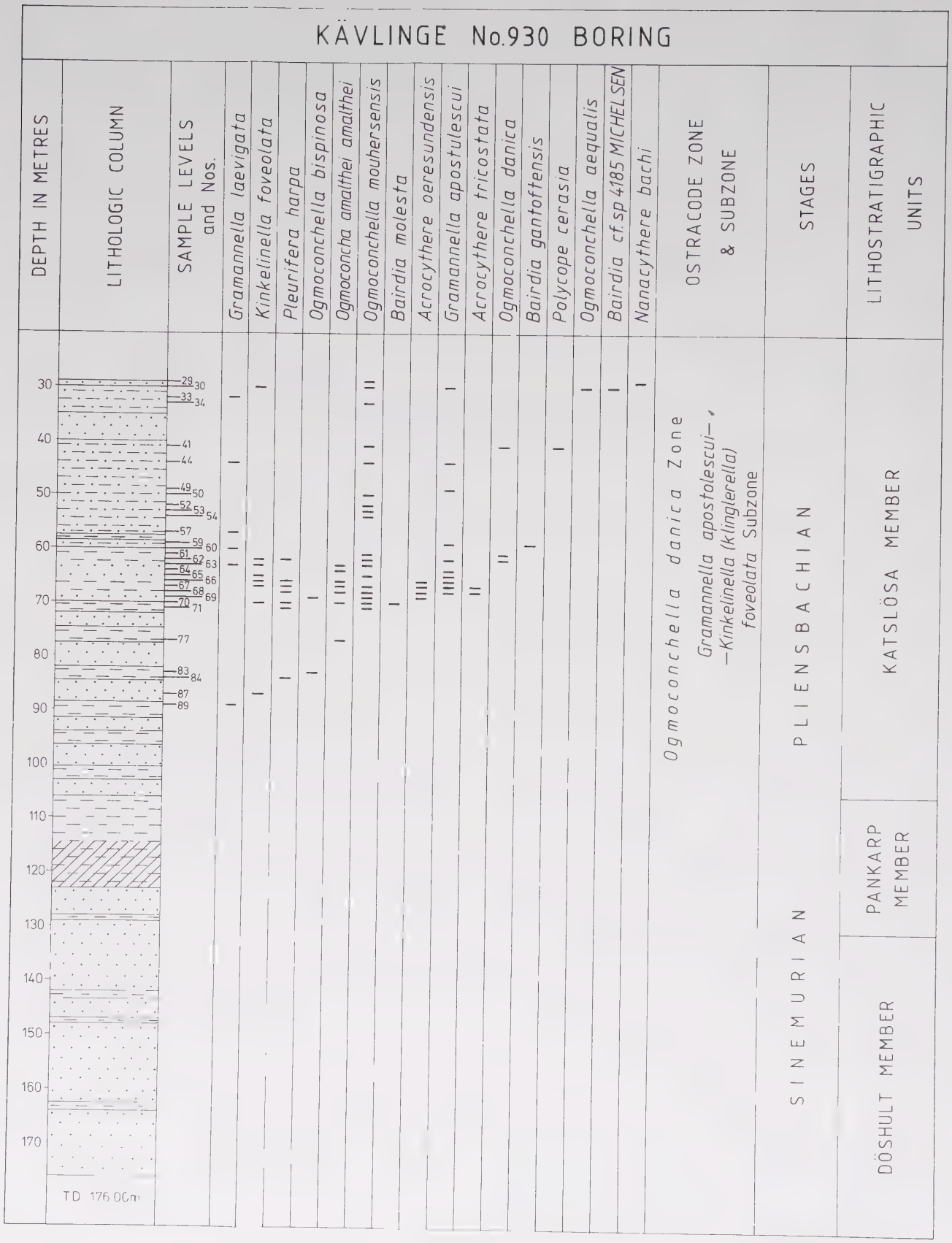


Fig. 15. Well log of the Kävlinge No. 930 boring.

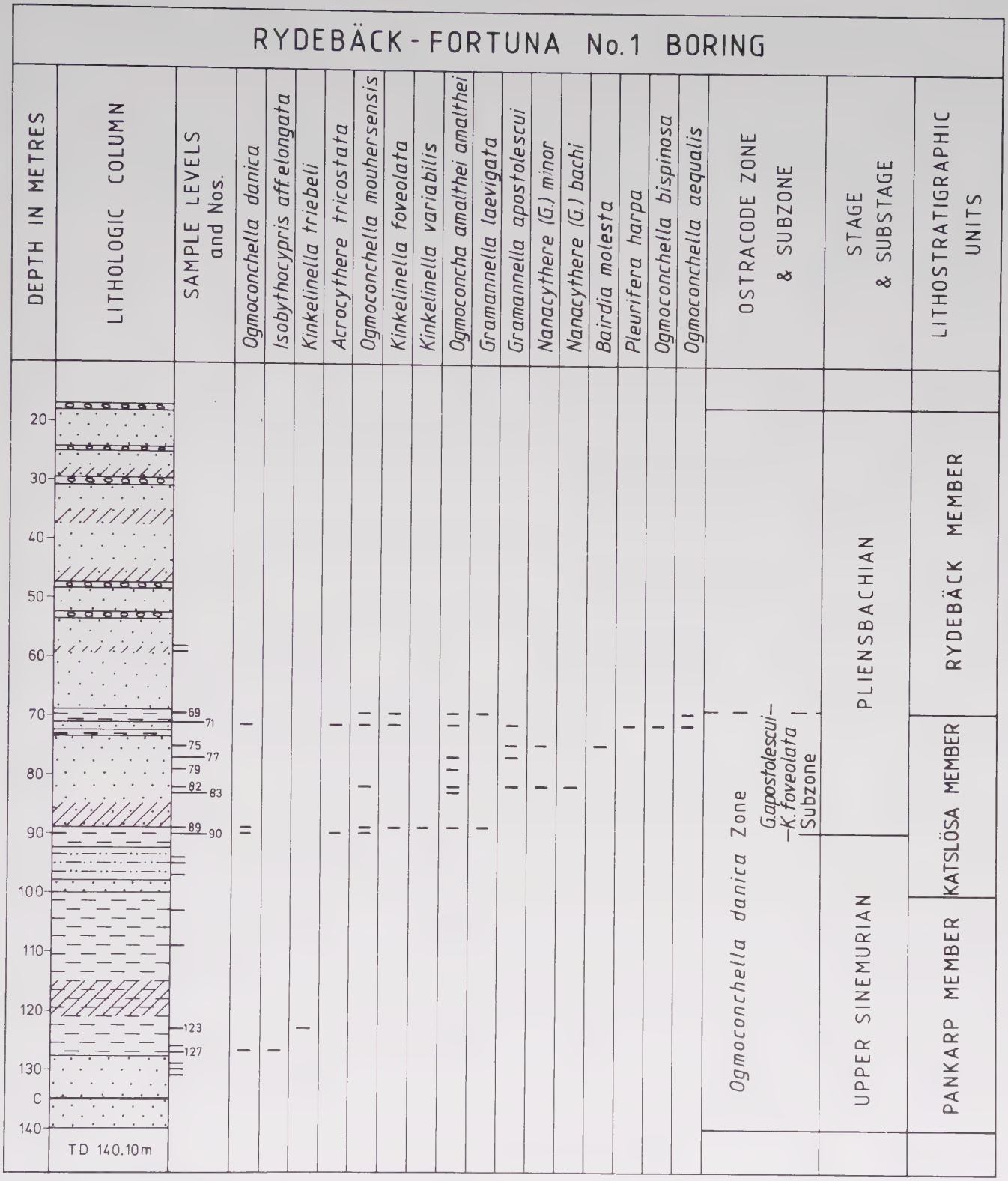


Fig. 16. Well log of the Rydebäck-Fortuna No. 1 boring.

Rydebäck-Fortuna No. 1 boring
Fig. 16

Location: About 10 km SSE of Helsingborg centre, by a stream c. 700 m SE of Rydebäck farm.
Maps: Topographical map sheet Helsingborg 3C SV, Geological map sheet Aa No. 74, Ae No. 16.
UTM co-ordinates: UC 6075 0452.
Elevation: C. 5 m a.s.l.
Drilling: Spudded September 22, completed October 11, 1967.
Drilling method: Core drilling.
Core diameter: 32 mm.
Total depth: 140.10 m.
Dip: 104–103 m 18°–20°, 103–100 m 20–25°, 98–93 m 10°, 93–65 m 12°, 65–41 m 15°, 35 m 25°, 29 m 20°.
Stratigraphic range: The Pankarp Member 140.10–100.00; the Katslösa Member 100.00–68.50 m; the Rydebäck Member 68.50–17.00 m; Pleistocene 17.00–0 m.

The boring was carried out by the Geological Survey of Sweden. It was planned by Norling and described by him (1970, pp. 261–287; 1972, pp. 25–28).

PANKARP MEMBER

Lithology.–In its lower part (140.10–128.00 m) the Pankarp Member is composed of a greyish siltstone with a coal seam. This sequence is overlain by dark grey to black claystones succeeded by a variegated claystone. The uppermost part of the member (114.00–100.00 m) consists of a grey claystone.

Biostratigraphy.–The Pankarp Member has yielded some ostracode species, viz. *Ogmoconchella danica, Isobythocypris* aff. *elongata* and *Kinkelinella katsloesensis*. These ostracodes indicate the Sinemurian and partly also the Pliensbachian. The foraminiferal fauna obtained in the same section (Norling 1972, pp. 25–26) is also composed of long ranging forms.

KATSLÖSA MEMBER

Lithology.–The lower part of the sediment in the Katslösa Member (100.00–89.00 m) consists of light grey and dark grey claystone intercalated with greyish brown claystone. The upper part of the section consists of calcareous siltstone, mainly grey coloured with subordinate light grey and greenish grey colours.

Biostratigraphy.–The Katslösa Member has yielded several ostracode species. The presence of *Gramannella apostolescui, Nanacythere minor, N. bachi,* and *Pleurifera harpa* in the upper part of the section together with i. e. *Kinkelinella foveolata, Ogmoconchella danica, G. laevigata,* and *"O." mouhersensis* indicates the *G. apostolescui–K. foveolata* Subzone.

RYDEBÄCK MEMBER

Lithology.–The sediments of the Rydebäck Member are composed of variegated siltstone with intercalations of claystone and conglomerates.

Biostratigraphy.–The ostracode fauna obtained from the Rydebäck Member has yielded fragmentary specimens of the genus *Ogmoconcha* as well as fragments resembling *Gramannella laevigata*. Norling (1972, p. 26) mentioned the occurrence of some ostracodes from the Rydebäck section, viz. ostracodes Nos 9, 13 and 14 of Klingler (1955) and *Aphelocythere kuhni*, indicating Pliensbachian, Toarcian, Aalenian, or Early Bajocian ages.

Rydebäck-Fortuna No. 4 boring
Fig. 17

Location: About 10 km SSE of Helsingborg centre, 1 km south of Rydebäck farm.
Maps: Topographical map sheet Helsingborg 3C SV, Geological map sheet Aa No. 74, Ae No. 16.
UTM co-ordinates: UC 6050 0350.
Elevation: C. 13 m a.s.l.
Drilling: Spudded November 11, 1967, completed January 22, 1968.
Drilling method: Core drilling.
Total depth: 147.14 m.
Dip: 136 m 25°, 124 m 18–22°, 99 m 15–18°, 98 m 15°, 89 m 15–20°, 85 m 18°, 82 m 20°, 74 m 40°.
Stratigraphic range: The Pankarp Member 147.14–135.00 m; the Katslösa Member 135–103 m; the Rydebäck Member 103–52 m; the "Eriksdal Beds" 52–23 m; Pleistocene 23–0 m.

The boring was carried out by the Geological Survey of Sweden. It was planned by Norling and described by him (1970, pp. 261–287; 1972, pp. 28–29).

PANKARP MEMBER

Lithology.–The sediment of the Pankarp Member consists of grey to bluish grey and variegated claystone with thin silty intercalations.

Biostratigraphy.–No ostracodes were found in the Pankarp Member.

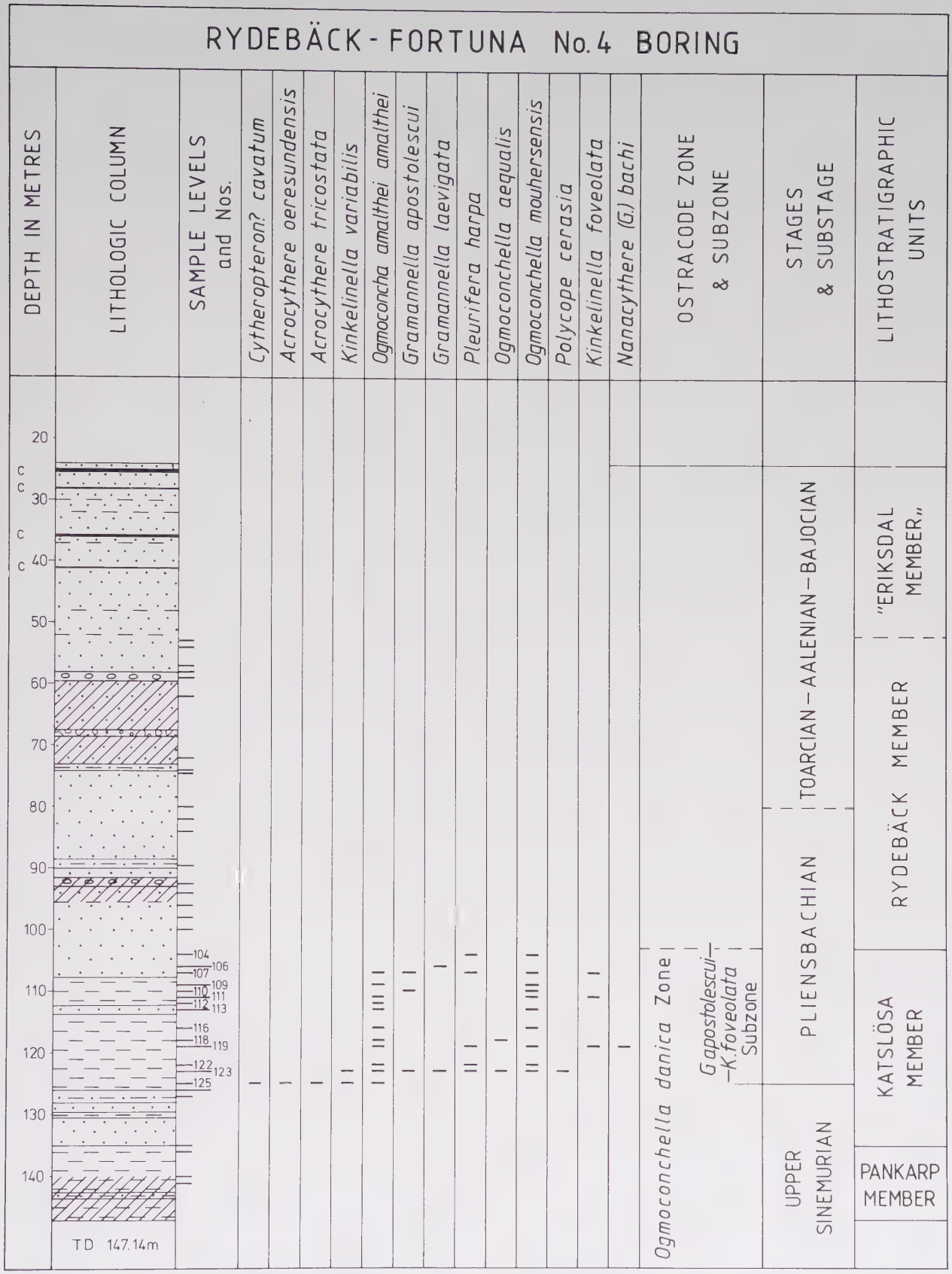


Fig. 17. Well log of the Rydebäck-Fortuna No. 4 boring.

KATSLÖSA MEMBER

Lithology.–The sediment of the Katslösa Member is mainly represented by grey, dark grey, and variegated claystone and siltstone.

Biostratigraphy.–In the interval between 123 and 104 m the ostracode fauna is composed of species characteristic of the *Gramannella apostolescui–Kinkelinella foveolata* Subzone. The fauna is fairly rich in specimens of *Ogmoconcha amalthei amalthei, "Ogmoconchella" mouhersensis* and *Pleurifera harpa.* The zonal denominators for that subzone viz. *G. apostolescui,* and *K. foveolata* have also been recorded.

At 125 m the faunal composition changes. Below this level the fauna consists of i.a. *Kinkelinella variabilis* and *Acrocythere oeresundensis,* ostracodes typical of the middle subzone of the *Ogmoconchella danica* Zone, but also of representatives of the upper one, such as *Ogmoconcha amalthei amalthei* and *Acrocythere tricostata.* The boundary between the two subzones is drawn at 125 m.

RYDEBÄCK MEMBER

Lithology.–The sediments of the Rydebäck Member mainly consist of variegated siltstone and dark grey silt and claystone, with conglomerate and iron oolite as subordinate components.

Biostratigraphy.–No ostracodes were found in the Rydebäck Member by me. However, Norling (1972, p. 29) mentioned the occurrence of the ostracode species *Aphelocythere kuhni* in the section between 52 and 76 m. *A. kuhni* ranges from the Toarcian to the Bajocian in Europe.

Öresund No. 1 boring

Fig. 18

Location: Offshore and northwest of Helsingborg.
Map: Topographical map sheet 3C Helsingborg SV.
Co-ordinates: Lat. 56° 4′, 3 N, Long. 12° 39′, 30 E.
Elevation: 17 m below sea level.
Drilling: Spudded June, completed July, 1958.
Drilling method: Core drilling.
Total depth: 48.80 m.
Core diameter: 42 mm.
Dip: 48.80–34.00 m 25°, 34–26 m 15°, 26–21 m 30°, 21.00–9.16 m 20°.
Stratigraphic range: Unknown | 48.80–42.80 | m; | the Döshult Member 42.80–9.16 m; Pleistocene 9.16–0 m.

The boring was carried out as a part of a program with the purpose of finding the best location for a bridge or tunnel between Sweden and Denmark.

The drill-core has been described by Norling (1966, p. 10, Text–Fig. 1; 1968, pp. 14–15, Text–Figs. 1, 4; 1972, p. 22 Text–Figs. 1, 5, Table 3). He assigned the penetrated sequence tentatively to the Lower Sinemurian (1973, p. 22) on foraminiferal evidence. The ostracode material treated in the present investigation was kindly placed at my disposal by Dr Norling.

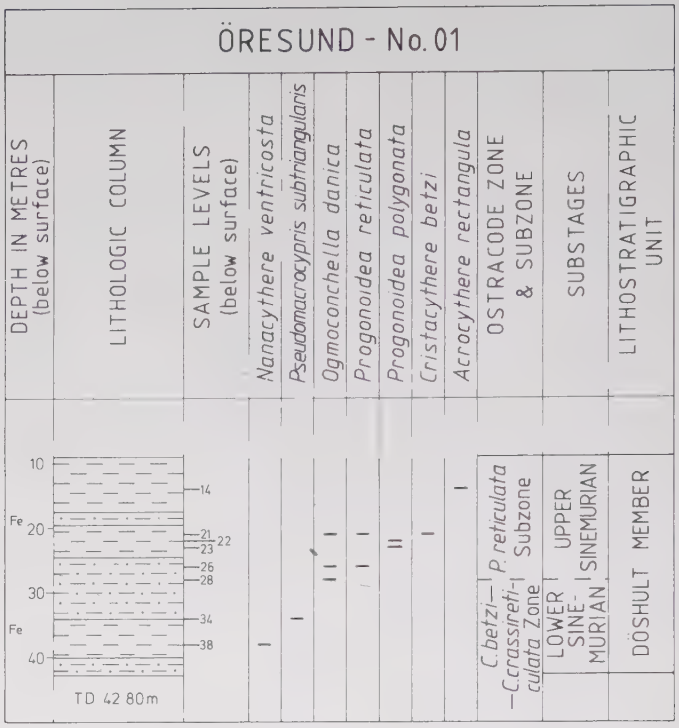


Fig. 18. Well log of the Öresund No. 1 boring.

DÖSHULT MEMBER

Lithology.–The sequence is made up of dark grey claystone intercalated with layers of silty claystone and ferruginous claystone.

Biostratigraphy.–The ostracode fauna contains i.a. *Ogmoconchella danica, Progonoidea reticulata,* and *Acrocythere rectangula.* These species are typical of the *P. reticulata* Subzone.

According to Norling (1973, p. 22) the section belongs to the Lower Sinemurian, while I refer it to the Upper Sinemurian. However, there is in fact no difference of opinion, because Norling included the ammonite zone with *Eusteroceras turneri* in the Lower Sinemurian while I include that zone in the Upper Sinemurian.

As neither representatives of *O. danica* nor of *P. reticulata* are recorded below 28 m, that part of the section is referred to the *Cristacythere betzi–C. crassireticulata* Zone. However, ostracode evidence for this statement is weak as neither specimens of *C. betzi* nor of *C. crassireticulata* have been recorded.

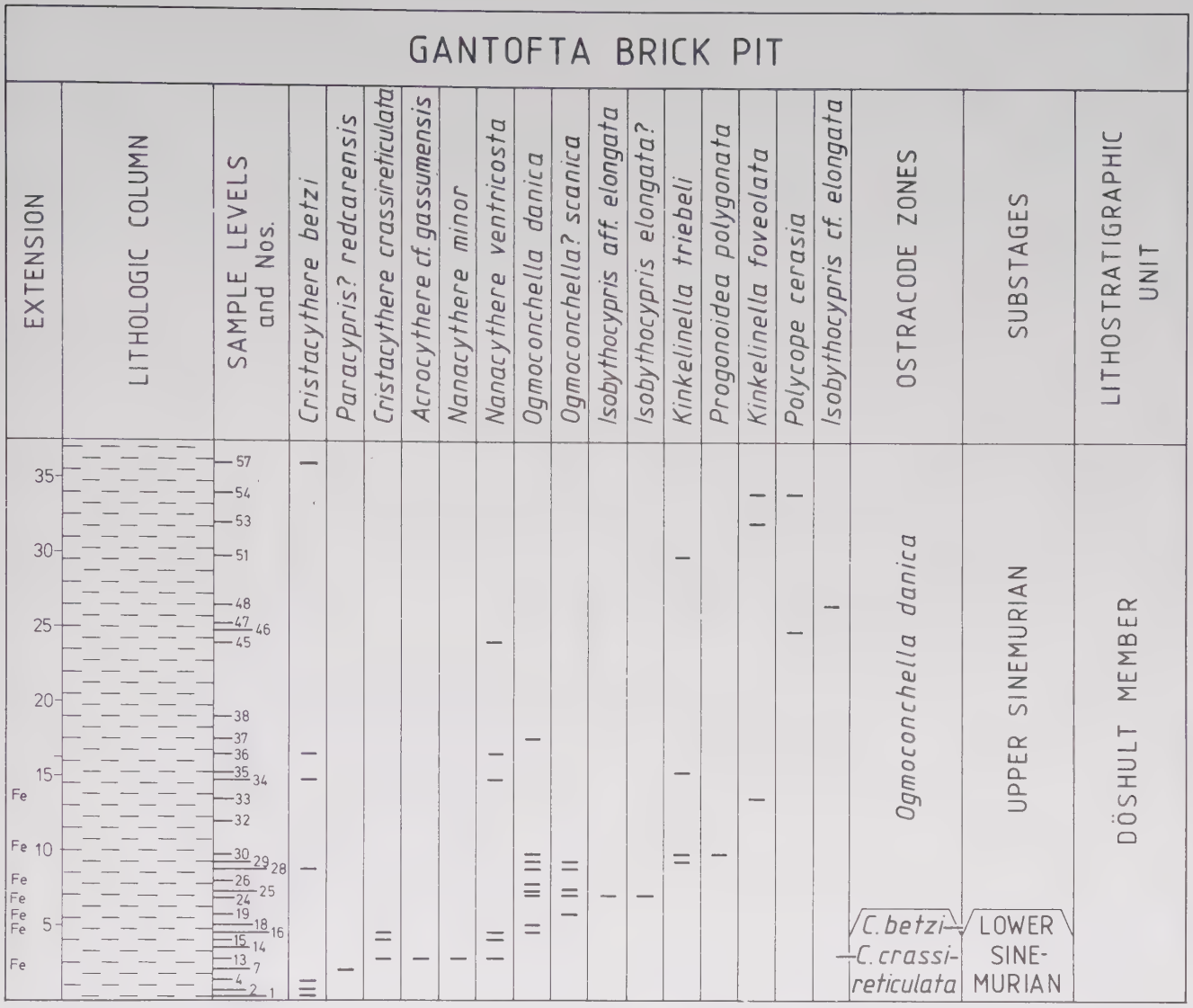


Fig. 19. The lithology and the distribution of the ostracodes obtained from the Gantofta Brick Pit correlated with lithological and biostratigraphical units.

The Gantofta Brick Pit

Fig. 19

Location: About 10 km SE of Helsingborg centre.
Maps: Topographical map sheet 3C Helsingborg SV, Geological map sheet Aa No. 74, Ae No. 16.
UTM co-ordinates: UC 6325 0645.
Elevation: About 30 m a.s.l.
Field extension: C. 100 m.
Dip: 25° to the south.
Stratigraphic range: The Döshult Member, and the Pankarp Member.

The pit belongs to the Höganäs Company. Sediment of the Pankarp Member is quarried and used for manufacturing firebricks.

The section was described by Reyment (1969a, pp. 208–216; 1969b, pp. 440–442), Norling (1972, pp. 22–23), Lund (1977, p. 37, Text–Fig. 5) and Sivhed (1977, pp. 1–31).

DÖSHULT MEMBER

Lithology.–The sediment of the Döshult Member is made up of dark grey, slightly silty claystone with a few ferruginous beds.

Biostratigraphy.–The ostracode fauna is described by Sivhed (1977). It consists of i.a. *Ogmoconchella danica, Cristacythere betzi* and *C. crassireticulata,* the zonal deno-

minators of the *O. danica* Zone and *C. betzi–C. crassireticulata* Zone respectively.

Only a few scattered ostracode specimens occur in each sample. They are often poorly preserved. The specimens of *Kinkelinella foveolata,* found in sample No. 54, are, however, well preserved.

Norling 1972 (pp. 22–23) described a foraminiferal fauna from a bed rich in the oyster, *Gryphaea arcuata,* appearing in the basal part of the sequence. He referred the fauna to the Lower Sinemurian.

Reyment (1969a, pp. 208–216; 1969b, pp. 440–442) described an ammonite fauna obtained from the upper part of the Döshult Member, near the boundary of the Pankarp Member. The ammonite fauna contains i.a. *Asteroceras obtusum* (SOWERBY), the zonal denominator of the *A. obtusum* Zone, indicating the Upper Sinemurian. About 2 m above the ammonite yielding horizon, the Döshult Member is followed by the Pankarp Member.

Lund (1977, Text–Fig. 5) described palynomorphs from two samples representing the Lower and the Upper Sinemurian respectively.

PANKARP MEMBER

Lithology.–The sediment of the Pankarp Member consists of variegated (red, green, and yellow) clays.

Biostratigraphy.–No ostracodes were found in the Pankarp Member. The fossil material obtained from the Pankarp Member is restricted to palynomorphs (Dr G. Vidal, personal communication 1979).

The Katslösa Exposure

Fig. 20

Location: About 10 km SE of Helsingborg centre.
Maps: Topographical map sheet Helsingborg 3C SV, Geological map sheet Aa No. 74, Ae No. 16.
UTM co-ordinates: UC 6270 0610–UC 6330 0620. (Loc. 600–1000).
Elevation: C. 30–35 m a.s.l.
Field extension: 174.25 m (Loc. 600–1000) after Troedsson 1951, pp. 70–71.
Dip: 600 m 38°, 680 m 42°, 745 m 40°, 825 m 37°, 840 m 30° 1000 m 28°, (Troedsson 1951, p. 68).
Stratigraphic range: The Katslösa Member (Loc. 756–970).

The section was exposed at the bottom of a ditch. It is no longer accessible as the ditch bottom is today covered with mud and vegetation. The section was exposed in the summer of 1945, when it was sampled and measured by Drs Troedsson, Brotzen, and Mohrén. The material dealt with in the present paper originates from their collections. The material was treated by Brotzen and is stored in the museum of the Section of Palaeozoology at the Swedish Museum of Natural History in Stockholm.

Troedsson (1951, pp. 66–80) gave a lithologic description of the section. He also described its macrofauna and gave some comments on microfossils obtained from the section. The locality was also treated by Bölau (1959, pp. 178–179; 1973, pp. 268–272) and Reyment (1959, p. 109). Norling (1968; 1970, pp. 15–16; 1972, pp. 23–24) described the foraminiferal fauna obtained from the section.

In the present paper the section between Loc. 756 and 975 is treated.

KATSLÖSA MEMBER

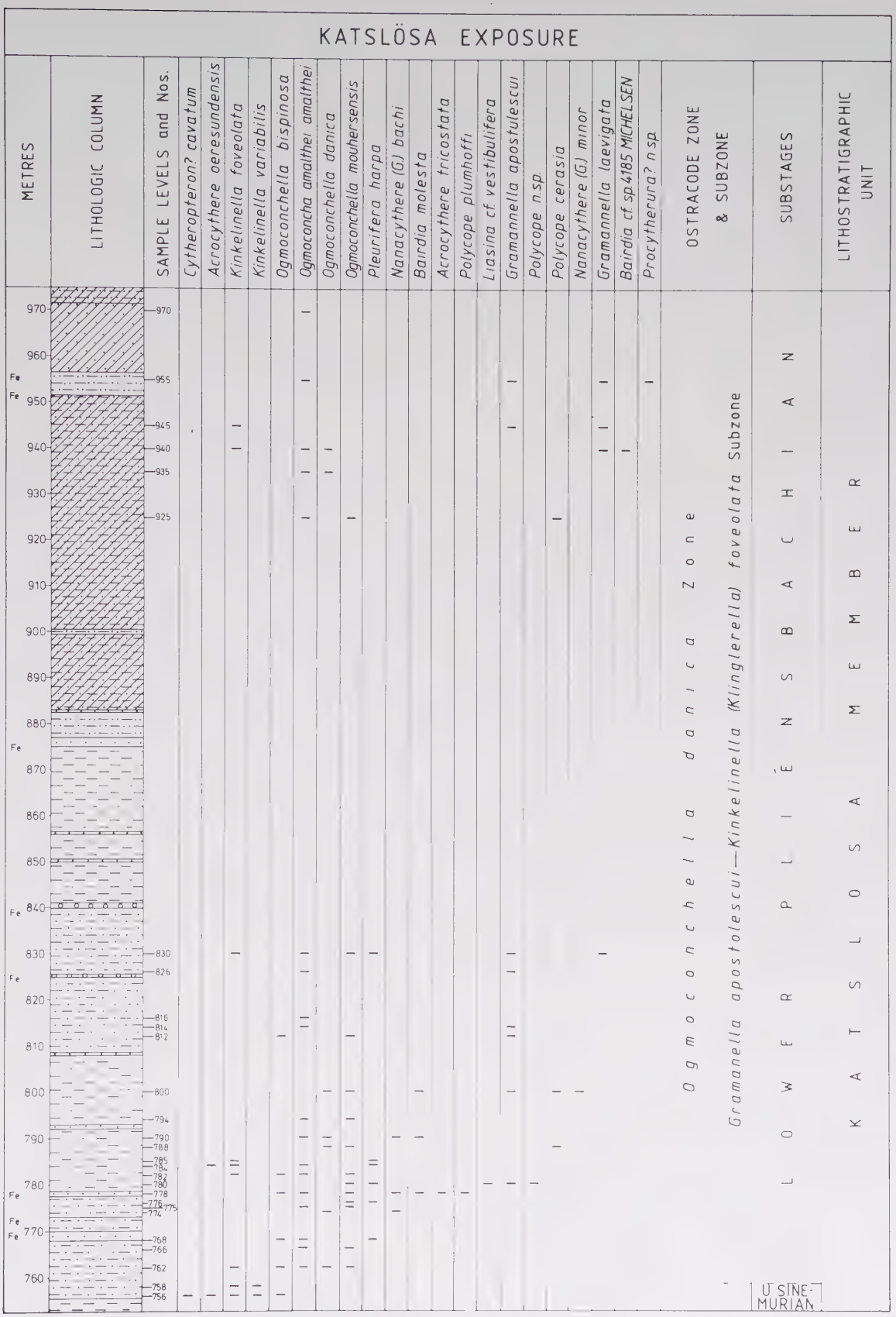
Lithology.–The lower part (Loc. 756–840) consists mainly of sandy clays with horizons of iron sandstone. The sequence between Loc. 785 and 808 consists of clay. At Loc. 825 a thin layer of iron oolite is recorded. The middle part (Loc. 840–875) is made up of clays with iron oolites at Loc. 840. The upper part (Loc. 883–975) consists of a variegated (green and brown) sandy clay.

Biostratigraphy.–The sequence treated has yielded both macro- and microfossils, indicating the upper part of the Upper Sinemurian and the Lower Pliensbachian.

The ostracode fauna in the section indicates the middle and upper subzones of the *Ogmoconchella danica* Zone. The boundary between the two sub-zones is drawn between Loc. 758 and 762. Characteristic species of the middle subzone are *Acrocythere oeresundensis* obtained at Loc. 756 and *Kinkelinella variabilis* obtained at Loc. 756 to 758. Species typical of the upper subzone of the *O. danica* Zone, the *Gramannella apostolescui–K. foveolata* Subzone have been recorded at the same level as representatives of the middle subzone of the *O. danica* Zone, viz. *O. bispinosa* at Loc. 756. Representatives of the *G. apostolescui–K. foveolata* Subzone found at higher levels are *Ogmoconcha amalthei amalthei* (Loc. 762–970), *Pleurifera harpa* (Loc. 768–830), *Nanacythere bachi* (Loc. 774–970), *A. tricostata* (Loc. 778), and *G. apostolescui* (Loc. 780–955).

The foraminiferal fauna treated by Norling (1968, p. 15, Text–Fig. 5) indicates the Upper Sinemurian at Loc. 775 to 790, the Upper Sinemurian and the Lower Pliensbachian at Loc. 790 to 890, and the upper part of the Lower Pliensbachian at Loc. 890 to 1000.

Troedsson (1951, p. 77) found fragments of the ammonite *Uptonia jamesoni* (SOWERBY) at Loc. 840, indicating the upper part of the *Uptonia jamesoni* Zone, Lower Pliensbachian. Troedsson (1951, pp. 71–80) also described a macrofauna rich in bivalves, belemnites, and gastropods.



20. The lithology and distribution of the ostracodes obtained from the Katslösa exposure correlated with lithological and stratigraphical units.

Locality No. 66 of Troedsson (1951)

Location: 4 km ESE of Viken church.
Maps: Topographical map sheet 3C Helsingborg NV,
Geological map sheet 3C Helsingborg NV, Ae No. 25.
UTM co-ordinates: UC 5310 2435.
Elevation: C. 14 m a. s. l.
Thickness of outcropping beds: C. 1.50 m.
Stratigraphic range: The Döshult Member.

The locality is a water filled marl pit. It is probably identical with the locality Dödshult No. 1 of Lundgren (1881, p. 12). Troedsson (1951, p. 40, Text–Fig. 11) mentioned the locality in his account of Rhaetic and Liassic sediments in northwest Skåne. He gave the locality the number 66. The locality was also mentioned by Reyment (1959, pp. 107, 108, 144, 145).

DÖDSHULT MEMBER

Lithology. – The outcropping sediments consist of greyish marls with a 10 cm thick, hard ferruginous claystone bed in the upper part.

Biostratigraphy. – The sediments which are of marine origin have yielded ostracodes, foraminifers, ammonites, and echinoids among other fossils.

The following ostracode species have been recorded: *Pseudomacrocypris subtriangularis, Paracypris? longiformis* n. sp., *Cristacythere betzi,* and *Polycope cerasia.*

A sample wieghing 1000 g was treated. *C. betzi* dominates with 139 complete carapaces and 152 isolated valves. Other species recorded occur only in numbers between 1 and 10 specimens. The occurrence of *C. betzi* indicates Sinemurian age. The fact that *Ogmoconchella danica* has not been recorded, may exclude the presence of Upper Sinemurian strata. Therefore this section is referred to the Lower Sinemurian.

Reyment (1959, pp. 144–145) pointed out that the ammonites from the Döshult area, including those treated by Lundgren (1881, p. 12) and Troedsson (1951, p. 40), might indicate the upper subzone, the *Arietites bucklandi* Subzone, of the *A. bucklandi* Zone.

The ammonite *Megarietites meridionalis,* which Reyment tentatively referred to the *A. bucklandi* Zone, is referred to the *Arnioceras semicostatum* Zone by Dean, Donovan, Howarth (1959, p. 451). According to Reyment, the material also clearly indicates the entire *Arnioceras semicostatum* Zone. Unfortunately none of the authors, who have reported on Döshult ammonites, have clearly defined where they collected their material. But it is very likely that some of the material originating from Döshult was collected at Troedsson's Locality No. 66.

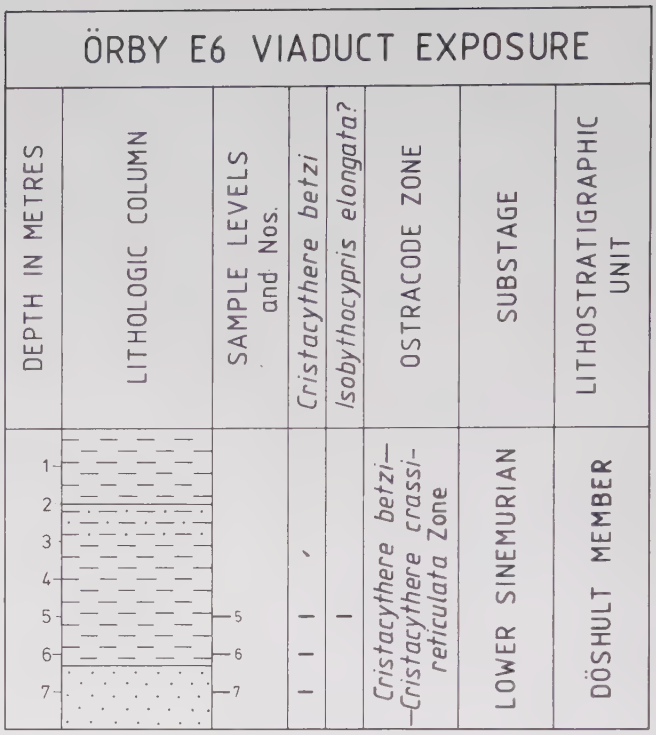


Fig. 21. The lithology and distribution of the ostracodes obtained from the Örby E6 viaduct exposure correlated with lithological and stratigraphical units.

Örby E 6 Viaduct Exposure
Fig. 21

Location: About 8 km SE of Helsingborg centre.
Maps: Topographical map sheet 3C Helsingborg SV, Geological map sheet Aa No. 74, Ae No. 16.
UTM co-ordinates: UC 6165 0735.
Elevation: About 26 m above sea level.
Field extension: 8.25 m.
Stratigraphic range: The Döshult Member.

This locality is situated at a road viaduct crossing between highway E 6 and a smaller road from Gantofta to Örby. I have not had the opportunity to study the section as it is covered with soil and vegetation.

The ostracode material from this section has been placed at my disposal by Dr E. Norling. The section was described in his 1972-publication (p. 22).

DÖSHULT MEMBER

Lithology.–When exposed, the lowermost part of the section was made up of a 2 m thick calcareous sandstone and siltstone, which, in the lower part, was rich in the oyster

Gryphaea arcuata (LAMARCK). The sandstone and siltstone sequence is overlain by shale and clay interbedded, and partly also by silty claystone.

Biostratigraphy.–Norling (1972, p. 22) referred the section to the Lower Sinemurian. He based his opinion on foraminiferal and lithologic evidence as well as on the occurrence of the ostracode *Cristacythere betzi*. I agree with this opinion. The section treated corresponds to the *C. betzi–C. crassireticulata* Zone and lithostratigraphically, to the Döshult Member.

INDEX OF OSTRACODES

Abbreviations

In the below text names of borings and localities are abbreviated as follows:

334 = Pankarp-Strövelstorp No. 334 boring
336 = Pankarp-Strövelstorp No. 336 boring
358 = Gantofta No. 358 boring
359 = Gantofta No. 359 boring
360 = Gantofta No. 360 boring
366 = Nyhus No. 366 boring
367 = Nyhus No. 367 boring
620 = Katslösa No. 620 boring
840 = Gantofta No. 840 boring
841 = Gantofta No. 841 boring
Kä = Kävlinge No. 930 boring
RF1 = Rydebäck-Fortuna No. 1 boring
RF4 = Rydebäck-Fortuna No. 4 boring
Ör = Öresund No. 1 boring
Öy = Örby E 6 Viaduct Exposure
Ga = The Gantofta Brick Pit
Ka = The Katslösa Exposure
T66 = Locality No. 66 of Troedsson (1951)

Order PODOCOPIDA MÜLLER, 1894
Suborder PODOCOPINA SARS, 1866
Superfamily BAIRDIACEA SARS, 1888
Family BAIRDIDAE SARS, 1888
Genus *Bairdia* McCOY, 1844

Bairdia gantoftensis n.sp.
Fig. 22; Pl. 1, Figs 1, 3–4

1975 *Bairdia* cf. *carinata* DREXLER.–Michelsen, p. 122, Pl. 1, Fig. 3.

DERIVATION OF THE NAME.–Latin *gantoftensis*, from the Gantofta area in which the type locality is situated.

HOLTYPE.–A carapace, SGU Type 399.

TYPE LOCALITY.–Gantofta No. 360 core drilling.

TYPE STRATUM.–Sample No. 26. Dark grey claystone. Upper part of the Lower Sinemurian. The *Cristacythere betzi–C. crassireticulata* Zone.

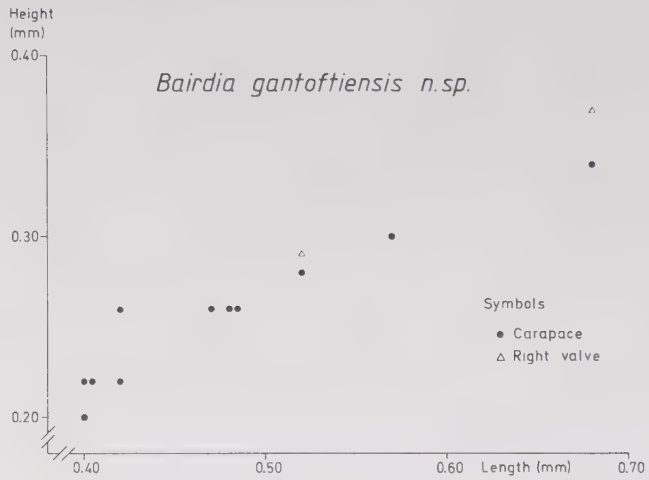


Fig. 22. Scatter diagram showing relations between numbers, length and height of *Bairdia gantoftensis* n.sp. Samples Nos. 334:19; 359:16; 360:12, 17, 26 and Kä:59.

MATERIAL.–12 complete carapaces and 2 right valves in samples 334:19; 359:16; 360:12, 17, 26; Kä:59.

DIAGNOSIS.–A species of *Bairdia*. Elongated in lateral view. Anterior end well rounded, posterior end extended along the ventral margin.

DESCRIPTION.–The dorsal margin between the cardinal angles is slightly concave in the right valve and slightly convex in the left one. The margin between the posterior cardinal angle and the extended part of the posterior margin is S-shaped. The posterior margin is acuminate with the extended point about one fourth of the height above the ventral margin. In front of the anterior cardinal angle the margin is slightly convex and passes evenly into the well rounded and nearly symmetrical anterior margin. The ventral margin is slightly convex with a concavity mid-ventrally.

The dorsal outline is an elongated oval, extended posteriorly with its largest width directly anterior to the mid-point. Zones along the anterior and postero-ventral margins are laterally compressed, forming flanges.

The left valve is larger than the right one which it overlaps along the dorsal margin and the central part of the ventral margin. The surface is smooth.

MEASUREMENTS.–Data from the measurable specimens are shown in Fig. 22.

REMARKS.–The present ostracodes are identical in all characteristics with the material of Michelsen (1975, p. 122). Only the two largest specimens in Fig. 22 are adults.

DISTRIBUTION.–Upper part of Lower Sinemurian and Lower Pliensbachian in Skåne. Hettangian and Upper Pliensbachian in Denmark (Michelsen 1975, p. 122).

Bairdia molesta APOSTOLESCU, 1959
Fig. 23; Pl. I, Figs. 2, 5–6, 9

1959 *Bairdia molesta* APOSTOLESCU.–Pp. 806–807, Pl. 2, Fig. 31.
1971 *Bairdia* aff. *Bairdia molesta* APOSTOLESCU.–Lord, pp. 649–650, Pl. 122, Figs. 10–12.
1975 *Bairdia molesta* APOSTOLESCU.–Michelsen, pp. 121–122, Pl. 1, Figs. 1–2.
1977 *Bairdia* cf. *hilda* JONES.–Knauff, p. 84, Pl. 1, Fig. 4.
1979a *Bairdia molesta* APOSTOLESCU.–Herrig, pp. 648–651, Text–Figs. 1–3.

MATERIAL.–12 complete carapaces and 1 right valve in samples 336:15; 359:17; 360:19, 27; Ka:778, 790, 800; Kä:70; RF1:75.

DIAGNOSIS.–See Apostolescu 1959, p. 809.

DESCRIPTION.–See Michelsen 1975, p. 121.

REMARKS.–The present material is divided into two morphologic groups. One group (morphologic group 2, Fig. 23; Pl. I, Figs. 2, 9) contains relatively short and high specimens while the other group (morphologic group 1, Pl. I, Figs. 5–6) contains longer and lower specimens. The first mentioned group has a calculated mean length-height relation of 1.55 while the other group has a corresponding relation of 1.72. Corresponding values for the holotype (Apostolescu 1959, p. 807) is 1.78 and for the material of Michelsen (1975, Pl. 1, Fig. 1) 1.83. The specimens of Knauff (1977, Pl. 1, Fig. 4) have a relation of 1.72. The specimens figured by Herrig (1979a, Text-Figs. 7–8) show a length-height relation between 1.66 and 2.00 for adults.

In my opinion, the variation of the present material is not dependent on sedimentary factors, as both types are represented in Lower Sinemurian and Lower Pliensbachian sediments in Skåne. Both types have also been recorded in the same sample.

No such variation is observed in the material of Michelsen (1975, p. 121). The variation in the present material includes the form described by Lord (1971, pp. 649–650) as *Bairdia* aff. *Bairdia molesta* APOSTOLESCU, 1959, with a length-height relation of 1.71.

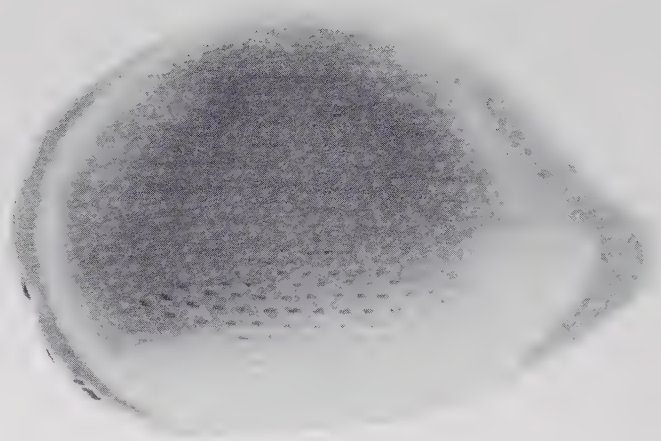


Fig. 23. Drawing of *Bairdia molesta*, morphologic group 2. Carapace, left side. Sample No. Ka: 788 (X110). SGU Type 401.

Unfortunately no sample investigated contains more than a maximum of two specimens of *Bairdia molesta*. Therefore, no continuous variation can be observed in the material. It is possible that the two morphological groups represent two different species. However, a study of a larger material would be necessary for solving this problem.

DISTRIBUTION.–Lower Sinemurian and Lower Pliensbachian in Skåne. Upper Sinemurian to Upper Pliensbachian in Denmark (Michelsen 1975, p. 122). Upper Hettangian in Germany (Knauff 1977, p. 84), Lower Sinemurian to Upper Pliensbachian in France (Apostolescu 1959, p. 807, Viaud 1963) and Hettangian in England (Lord 1971, p. 650).

Bairdia cf. sp. 4185 MICHELSEN, 1975
Pl. 1, Figs. 7–8

cf. 1968 *Bairdia* sp. 811 CHRISTENSEN.–Pl. 23, Fig. 65.
cf. 1975 *Bairdia* sp. 4185 MICHELSEN.–Pp. 122–123, Pl. 1, Figs. 5–8.

MATERIAL.–2 complete carapaces in samples Ka:940 and Kä:30.

DESCRIPTION.–See Michelsen 1975, p. 123.

REMARKS.–The present material differs from the material of Michelsen (1975, p. 123) in being a little more elongated and lacking the flanges ventrally. The postero-ventral margin is almost straight in the present material. It is possible that the recorded specimens should be included in the variation of *Bairdia michelseni* (Herrig 1979a, pp. 655–657). His specimens are, however, mostly more extended posteriorly than the present ones.

DISTRIBUTION.–Lower Pliensbachian in Skåne, Upper Pliensbachian in Denmark (Michelsen 1975, p. 123).

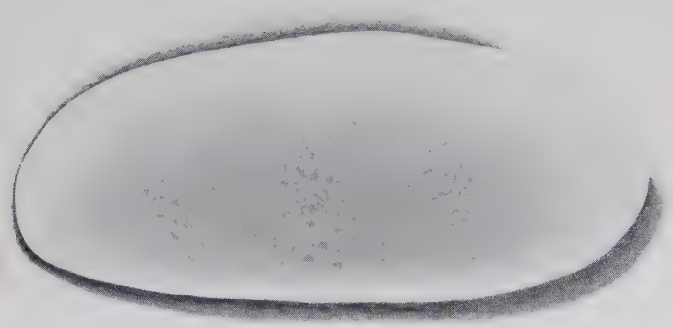


Fig. 24. Drawing of *Isobythocypris* aff. *elongata*. Carapace, right side. Sample No. 360:11 (X115). SGU Type 412.

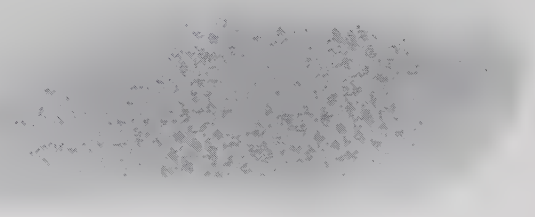


Fig. 25. Drawing of *Isobythocypris elongata*? Carapace, right side. Sample No. 359:6 (X110). SGU Type 407.

Genus *Isobythocypris* APOSTOLESCU, 1959

Isobythocypris elongata (BLAKE, 1876)

1876 *Bairdia elongata* BLAKE.–P. 431, Pl. 17, Fig. 5.

DESCRIPTION.–See Blake 1876, p. 431.

REMARKS.–The ostracodes referred to this group are as a rule poorly preserved. They are commonly deformed and pyritized. In this paper they are divided into three species according to the carapace outline: *Isobythocypris* cf. *elongata* (BLAKE, 1876), *I.* aff. *elongata* (BLAKE, 1876) and *I. elongata* (BLAKE, 1876)?

Blake's material is represented by one drawing only, which does not include the finer details. The present material is therefore tentatively referred to the species *I. elongata* as a comparison with the type material has not been made. The three species recognized in the present investigation are described below.

DISTRIBUTION.–Upper Hettangian and Lower Sinemurian in England (Blake 1976, p. 431).

Isobythocypris aff. *elongata* (BLAKE, 1876)
Fig. 24; Pl. II, Figs. 10–12

aff. 1876 *Bairdia elongata* BLAKE.–P. 431, Pl. 17.
1969b *Isobythocypris* cf. *elongata* (BLAKE).–Herrig, pp. 1076–1077, Text–Fig. 3, Pl. 2, Figs. 1a–e.
1975 ?*Isobythocypris elongata* (BLAKE).–Michelsen, pp. 124–125, Pl. 1, Figs. 10–11; Pi. 3, Figs. 31–32.

MATERIAL.–9 complete carapaces, 3 left valves, and 5 right valves in samples 359:4, 6; 360:6, 13, 14, 26; RFl:127; Ga:24.

DESCRIPTION.–See Herrig 1969, pp. 1076–1077.

REMARKS.–The carapace outline of the present specimens resembles the outline of specimens belonging to the Permo–Carbonian genus *Bairdiacypris* BRADFIELD, 1935. It might therefore be justified to refer the present specimens to the genus *Bairdiacypris*. It is my opinion, however, that the recorded specimens should be attributed to the genus *Isobythocypris* until better preserved material has been studied.

DISTRIBUTION.–Upper part of Lower Sinemurian, lower part of Upper Sinemurian in Skåne and Upper Pliensbachian in Germany (Herring 1969b, p. 1077).

Isobythocypris elongata (BLAKE, 1876)?
Fig. 25; Pl. II, Figs. 13–15

? 1876 *Bairdia elongata* BLAKE.–P. 431, Pl. 17.
pars. 1958 *Bythocypris* cf. *elongata* (BLAKE).–Drexler, pp. 515–516, Pl. 23, Figs. 1c–f; Pl. 27, Figs. 1–2.
1959 ?*Isobythocypris elongata* (TATE & BLAKE). –Apostolescu, p. 808, Pl. 2, Figs. 24–25.
1977 *Isobythocypris* sp. 4020 MICHELSEN, 1975.–Sivhed, p. 10, Pl. 2, Figs. 5–6.

MATERIAL.–84 complete carapaces, 1 left valve and 3 right valves in samples 334:65, 72; 359:6, 17; 360:7, 12, 13, 14, 17, 18, 19, 26; 841:9; Ga:24; Öy:5.

DESCRIPTION.–Viewed laterally, the carapace is an elongated oval. The dorsal margin is slightly convex with a bend posterior to the mid-point (at the greatest height of the carapace). The dorsal margin is slightly concave anterior to the mid-point. The posterior margin is convex, elongated ventrally. The posterior margin is dorsally rounded and extended, mid-anteriorly straight and antero-ventrally angled. The ventral margin is in the left valve straight and in the right valve slightly concave. The carapace is disc-shaped in a dorsal view. The inner lamella is broad. The external surface is smooth. The adductor muscle scars are made up of four rounded vertical groups of muscle scars each group consisting of two or three more or less rounded muscle scars.

REMARKS.–The present specimens very closely resemble *Isobythocypris* aff. *elongata* (this paper). *I.* aff. *elongata* is, however, longer and more slender than the present form. It is possible that the two forms represent the same species as the two species often occur together. If so, the difference in carapace outline might be due to ecological circumstances or to sexual dimorphism.

In the present material, the adductor muscle scar is very similar to that described by Herrig (1969b, Text–Fig. 3), which consists of three elongated spots with a fourth rounded one. The rounded spot is subdivided into two more or less curved, elongated halves.

It is possible that the present material consists of more than one species. As it is generally poorly preserved, however, no exact determination can be made. It is worth noting that the carapace outline of the specimens determined as *Bairdiacypris triassica postera* (by Herrig 1979b, p. 777; Text–Fig. 11) is identical to that of the present specimens, whereas, the muscle scar area is completely different (cf. Pl. II, Figs 13, 15 in this paper).

DISTRIBUTION.–Lower and Upper Sinemurian in Skåne. Upper part of Lower Sinemurian in Germany (Drexler 1958, p. 515) and Upper Sinemurian in France (Apostolescu 1959, p. 808).

Isobythocypris cf. *elongata* (BLAKE, 1876)
Fig. 26; Pl. II, Figs. 16–19

cf. 1876 *Bairdia elongata* (BLAKE, 1876).–P. 431, Pl. 17, Fig. 5.
1975 *Isobythocypris* cf. *elongata* (BLAKE, 1876).–Michelsen pp. 126–127; Pl. 3, Figs. 29–30.

MATERIAL.–7 complete carapaces and 1 right valve in samples 359:4; 360:7, 11, 12, 13; Ga:48.

DESCRIPTION.–The carapace is laterally oviform. The dorsal margin is convex with a marked bend at about mid-length (at the greatest height of the carapace). The ventral margin is straight in the left valve and slightly concave in the right one. The anterior margin is evenly rounded. The posterior margin is rounded and slightly extended ventrally at about one third of the height of the carapace. The left valve is larger than the right one which it overlaps along the margin.

The dorsal outline is an elongated oval with tapered ends and with the largest width posteriorly.

The external surface is smooth.

REMARKS.–The carapace is rather high in relation to its length. The present material agrees with *Isobythocypris* cf. *elongata* of Michelsen (1975, Pl. 3, Figs. 29–30). The material does not, however, agree either with the ostracodes of Drexler (1958, Pl. 23, Fig. 1; Pl. 26, Figs. 7–9; Pl. 27, Figs. 1–2) or with those of Apostolescu (1959, Pl. 2, Figs. 24–25). The latter are longer in relation to their height and more elongated postero-ventrally than the ostracodes presented herein. Michelsen included the material of Apostolescu and Drexler (with a few exceptions) in *Isobythocypris* cf. *elongata* (BLAKE, 1876).

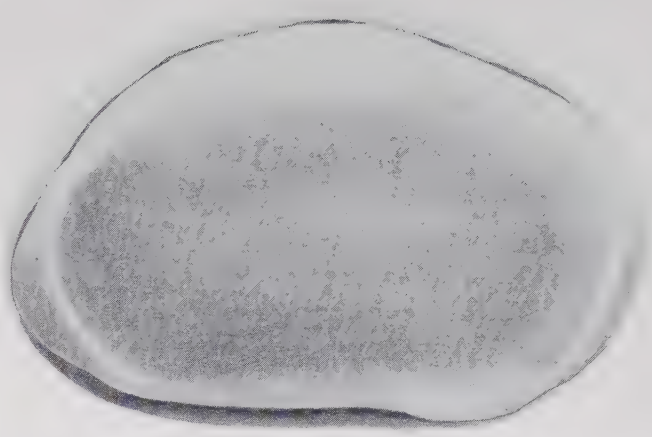


Fig. 26. Drawing of *Isobythocypris* cf. *elongata*. Carapace, right side. Sample No. 359:6 (X105). SGU Type 408.

DISTRIBUTION.–Upper Sinemurian in Skåne, Upper Sinemurian and Upper Pliensbachian in Denmark (Michelsen 1975, pp. 126–127).

Family MACROCYPRIDIDAE MÜLLER, 1912
Genus *Pseudomacrocypris* MICHELSEN, 1975

Pseudomacrocypris subtriangularis MICHELSEN, 1975
Pl. III, Figs. 20, 22, 25

1968 *Paracypris*? sp. 854 CHRISTENSEN.–Pl. 23, Fig. 2.
1968 *Macrocypris*? sp. 855 CHRISTENSEN.–Pl. 23, Fig. 4.
1970 *Macocypris* No. 4023 MICHELSEN.–Pp. 33–35, Pl. 12, Figs. 1a–b; Text–Fig. 2.
1975 *Pseudomacrocypris subtriangularis* MICHELSEN.–Pp. 132–134, Pl. 2, Figs. 22–28; Pl. 4, Figs. 40–41, 44–45.

MATERIAL.–61 complete carapaces, 1 left valve, and 1 right valve in samples 334:69, 70, 71; 359:10; 360:7; 366:18; 367:14, 25; 841:1–4, 6, 8; T:66; Ör:34.

DIAGNOSIS and DESCRIPTION.–See Michelsen 1975, p. 133.

REMARKS.–Adult form and two instar forms are recorded. They agree in size with the specimens in sample No. 21 of the Rødby No. 1 drill-core (Michelsen 1970, Text–Fig. 2).

Most of the specimens treated in the present work are deformed. In some of the deformed specimens the carapace outline agrees with that described by Christensen (1968, Pl. 23, Fig. 4). It is possible that other species than *P. subtriangularis* are represented in the deformed material.

DISTRIBUTION.–Sinemurian in Skåne, Hettangian to basal part of Lower Pliensbachian in Denmark (Michelsen 1975, p. 134; 1978, p. 78).

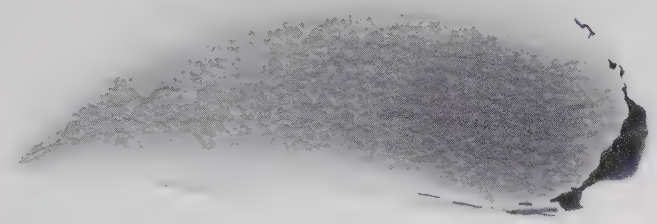


Fig. 27. Drawing of *Paracypris*? *longiformis* n. sp. Carapace, right side, holotype. Sample No. 334:8 (X130). SGU Type 418.

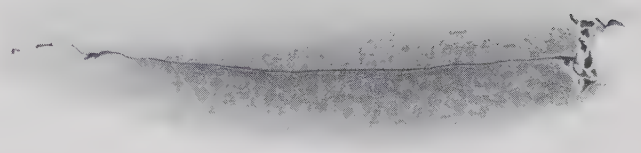


Fig. 28. Drawing of *Paracypris*? *longiformis* n. sp. Carapace, dorsal view, holotype. Sample No. 334:8 (X135). SGU Type 418.

Superfamily CYPRIDACEA BAIRD, 1845
Family PARACYPRIDIDAE SARS, 1923
Genus *Paracypris* SARS, 1866

Paracypris? *longiformis* n. sp.
Figs. 27–28; Pl. III, Figs. 21, 24

1975 *Paracypris*? sp. 4091 MICHELSEN.–P. 135, Pl. 4, Figs. 46–47.

DERIVATION OF THE NAME.–Latin *longus* and *forma* referring to the outline of the carapace.

HOLOTYPE.–A carapace. SGU Type 418.

TYPE STRATUM.–Sample No. 8 in Pankarp-Strövelstorp No. 334 core drilling. Claystone, sandy, grey with brown iron concretions, *Uptonia jamesoni* Zone (Bölau 1973, p. 269, Fig. 1), lower part of Lower Pliensbachian.

MATERIAL.–2 complete carapaces in samples 334:8 and T:66.

DIAGNOSIS.–A species of *Paracypris*? with elongated carapace. Posterior end extended ventrally.

DESCRIPTION.–In lateral view, the outline is elongated with the greatest height at the anterior cardinal angle. The dorsal margin between the weakly marked cardinal angles is straight with a weak concavity postero-ventrally. The anterior margin is broadly rounded and extended ventrally. In dorsal view the carapace is disc-shaped, with its greatest width one third of the length from the anterior end, and slightly concave at the mid-point. The carapace is smooth.

REMARKS.–The present material has been compared to and agrees with the four specimens recorded by Michelsen (1975, p. 135). As only carapaces are recorded, no inner features have been observed. The present material could possibly agree with *Macrocypris mucronata* (Conti 1954, p. 227, Pl. 12, Fig. 5).

DISTRIBUTION.–Lower Sinemurian and lower part of Lower Pliensbachian in Skåne, Lower Sinemurian, lower part of Upper Sinemurian and Upper Pliensbachian in Denmark (Michelsen 1975, p. 135).

Paracypris? *redcarensis* (BLAKE), 1876
Pl. III, Figs. 23, 26, 28, 30

1876 *Bairdia redcarensis* BLAKE.–P. 431, Pl. 17, Fig. 4.
1959 ?*Paracypris redcarensis* (BLAKE).–Apostolescu, p. 806, Pl. 2, Fig. 32.
1968 *Paracypris* sp. 878 CHRISTENSEN.–Pl. 23, Fig. 33.
1975 *Paracypris*? *redcarensis* (BLAKE).–Michelsen, pp. 134–135, Pl. 4, Figs. 48–49.
1977 *Paracypris*? *redcarensis* (BLAKE).–Sivhed, pp. 10–11, Pl. 1, Figs. 1–2.

MATERIAL.–5 complete carapaces in samples 359:16; 360:22 and Ga:7.

DIAGNOSIS.–See Blake 1876, p. 431.

DESCRIPTION.–See Michelsen 1975, pp. 134–135.

REMARKS.–The recorded material is pyritized.

DISTRIBUTION.–Lower Sinemurian in Skåne, Pliensbachian in Denmark (Michelsen 1975, p. 135). Hettangian and Lower Sinemurian in England (Blake 1876, p. 460), Sinemurian to Pliensbachian in France (Apostolescu 1959, p. 806, Viaud 1963). The species has also been recorded from the Lower Toarcian in France (Oertil & Grosdidier 1961, p. 460).

Family PONTOCYPRIDIDAE MÜLLER, 1894
Genus *Liasina* GRAMANN, 1963

Liasina cf. *vestibulifera* GRAMANN, 1963
Pl. III, Fig. 29

cf. 1963 *Liasina vestibulifera* GRAMANN.–Pp. 67–68, Pl. 3, Figs. 1–3.
cf. 1968 *Liasina vestibulifera* GRAMANN.–Christensen, Pl. 23, Fig. 62.
cf. 1975 *Liasina vestibulifera* GRAMANN.–Michelsen, p. 136, Pl. 4, Figs. 51–52.
cf. 1978 *Liasina vestibulifera* GRAMANN.–Lord, p. 200, Pl. 2, Fig. 9, Table 1.

MATERIAL.–2 complete carapaces, 1 left valve and 1 right valve in samples 334:67; 359:4; 841:5; Ka:780.

DIAGNOSIS and DESCRIPTION.–See Gramann 1963, pp. 67–68.

REMARKS.–All specimens studied are poorly preserved. The carapace outline and the vestibulum resemble those of *Liasina vestibulifera*. Therefore the specimens discussed are tentatively referred to *Liasina vestibulifera*.

DISTRIBUTION.–Sinemurian and Lower Pliensbachian in Skåne, Upper Pliensbachian in Denmark (Michelsen 1975, p. 136). Pliensbachian in Germany (Gramann 1963, p. 68), upper part of Lower Pliensbachian and lower part of Upper Pliensbachian in Great Britain (Lord 1978, p. 207), and Sinemurian to Pliensbachian in France (Viaud 1963).

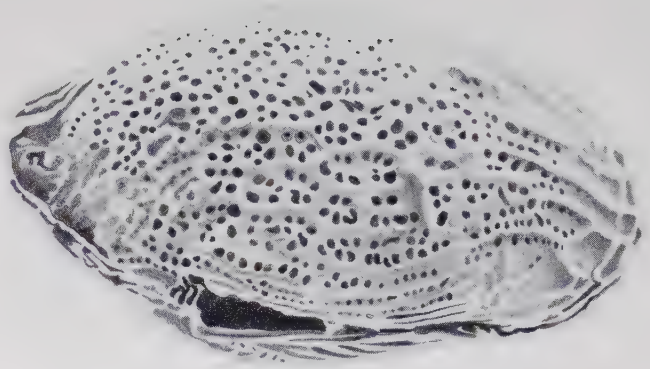


Fig. 29. Drawing of *Procytherura*? n. sp. Carapace, right side, holotype. Sample No. Ka:955 (X240). SGU Type 424.

Superfamily CYTHERACEA BAIRD, 1850
Family CYTHERURIDAE MÜLLER, 1894
Genus *Cytheropteron* SARS, 1866

Cytheropteron? *cavatum* MICHELSEN, 1975
Pl. III, Fig. 27

1968 *Cytheropteron* sp. 869 CRISTENSEN.–Pl. 23, Fig. 25.
1975 *Cytheropteron*? *cavatum* MICHELSEN.–Pp. 144–145, Pl. 6, Figs. 70–71.

MATERIAL.–1 complete carapace and 2 right valves in samples Ka: 756 and RF4:125.

DIAGNOSIS and DESCRIPTION.–See Michelsen 1975, p. 144–145.

REMARKS.–The complete carapace in sample Ka:756 is pyritized and the two remaining specimens obtained from RF4:125 are poorly preserved.

DISTRIBUTION.–Upper part of Upper Sinemurian in Skåne, Lower Sinemurian to Lower Pliensbachian in Denmark (Michelsen 1975, p. 145).

Genus *Procytherura* WHATELY, 1970

Procytherura? n. sp.
Fig. 29; Pl. III, Fig. 31; Pl. IV, Figs. 32, 38

MATERIAL.–1 complete carapace in sample Ka:955.

HOLOTYPE.–SGU Type 424.

DESCRIPTION.–The carapace is oval in lateral view, anteriorly rounded, with a distinct caudal extension posteriorly, and with the greatest height medianly. In dorsal view it is an elongated oval. The right valve overlaps the left along the dorsal margin. The ornamentation consists of three longitudinal ribs anteriorly, anterior medianly to posteriorly of a reticulation and with an intercostal ornamentation of fine pits, and ventromedianly, in front of the median point, a short longitudinal, broad rib. The ornamentation on the ventral side consists of longitudinal ribs with a pitted interarea. A weak eye swelling is observed.

MEASUREMENTS.–Length 0.34 mm, height 0.18 mm.

REMARKS.–The carapace outline is identical with that of the genus *Procytherura*. But, as neither the hinge nor the vestibulum can be seen, the present specimen is only tentatively referred to the Genus *Procytherura*.

DISTRIBUTION.–Lower Pliensbachian in Skåne.

Family PROGONOCYTHERIDAE SYLVESTER-BRADELY, 1948

Ideas on the higher taxonomy of ostracodes vary in the literature. Regarding the classification of genera referred (by Michelsen 1975, pp. 152–196) to the subfamily Protocytherinae different suggestions have been made by different authors.

Bate & Coleman (1975, p. 14) referred the genus *Kinkelinella* to the subfamily Kirtonellinae of the family Protocytheridae considering the V-shaped frontal scar. The family Protocytheridae was raised from subfamily to family level by Bate (1963, p. 209). This change in taxonomic rank was motivated (Bate 1963, p. 209; 1975, p. 14) by different outlines of the frontal muscle scar in genera of the former subfamily Protocytherinae and other members of Progonocytheridae. According to Bate, members of the Protocytheridae, have a muscle scar pattern in which the frontal scar is V-shaped while genera placed in the Progonocytheridae s.s. have oval or crescent-shaped frontal scars with smaller ones frontally. However, subdivision into families, mainly based on the outline of the frontal scar is not satisfactory. Just one look at the frontal scar variation in different species of the genus *Gramanella* (placed in the Progonocytheridae by Michelsen

1975) supports this argument. The frontal scar of *G. apostolescui* is crescent-shaped in outline, with the opening of the crescent directed anteriorly (Michelsen 1975, Pl. 13, Fig. 196). That of *G. tatei* is circular (Michelsen 1975, Pl. 13, Fig. 201), while that of *G. laevigata* is slightly U-shaped with the opening of the scar directed dorsally (Pl. V, Fig. 50; Michelsen 1975, Pl. 13, Fig. 200).

Malz & Lord (1976, p. 250) preferred to place the taxa discussed in the Schulerideinae on phylogenetic grounds, an opinion advanced by Malz (1961b, p. 177). Malz (1961a) claimed that one single feature, for instance the outline of the hinge, is not meaningful as a criterion for a subfamily. In his opinion, all features of the carapace taken together should be considered on establishing a subfamily.

It is my hope that further taxonomic studies might bring order into this problem. Until then, Michelsen's (1975) subdivision will be used.

Subfamily PROTOCYTHERINAE LYUBIMOVA, 1950
Genus *Acrocythere* NEAL, 1960

The *Acrocythere oeresundensis* group of MICHELSEN, 1975
Acrocythere cf. *gassumensis* MICHELSEN, 1975
Pl. IV, Figs. 33, 35

cf. 1968 *Monoceratina* sp. 653 CHRISTENSEN.–Pl. 23, Fig. 7.
cf. 1975 *Acrocythere gassumensis* MICHELSEN.–Pp. 153–154, Pl. 7, Figs. 97–100; Pl. 8, Figs. 117–119.
1977 *Acrocythere* cf. *gassumensis* SIVHED.–Pp. 11–12, Pl. 1, Figs. 3–4.

MATERIAL.–12 complete carapaces, 4 left valves and 2 right valves in samples 359:17; 360:18, 27; 620:158; Ga:13; T:66.

DIAGNOSIS and DESCRIPTION.–See Michelsen 1975, pp. 153–154.

REMARKS.–The present material differs from the type material in size and carapace outline, in the same way as pointed out by Sivhed (1977, pp. 11–12). Worth noting is that the specimens studied in some cases have two indistinct knots near the anterior cardinal angle.

The investigated material seems to represent a form transitional between *A. gassumensis* and *"Cythere" terquemiana* JONES, 1872 (cf. Lord 1971, pp. 657–658).

DISTRIBUTION.–Lower Sinemurian in Skåne, Lower Sinemurian and lower part of Upper Sinemurian in Denmark (Michelsen 1975, p. 154; 1978, p. 83). *"C." terquemiana,* Upper Hettangian in England (Lord 1971, p. 643).

Acrocythere oeresundensis MICHELSEN, 1975
Pl. IV, Figs. 34, 36, 39

1968 *Cytheropteron* sp. 848 CHRISTENSEN.–Pl. 23, Fig. 38.
1975 *Acrocythere oeresundensis* MICHELSEN.–Pp. 155–156, Pl. 7, Figs. 101–104; Pl. 8, Figs. 120–124.

MATERIAL.–5 complete carapaces, 1 left valve and 2 right valves in samples 620:28; Ka:756, 784; Kä:66–69; RF4:125.

DIAGNOSIS and DESCRIPTION.–See Michelsen 1975, pp. 155–156.

REMARKS.–The specimens treated are of the same size as the type material. Adult form (A) and two instar forms (A1 and A2) are available in the material from Skåne.

The alate extension varies. It is generally rather indistinct in the ostracodes studied. Except for the specimens in samples Kä: 66 and 67 in which it is strongly pronounced.

DISTRIBUTION.–Uppermost part of Upper Sinemurian and Lower Pliensbachian in Skåne, upper part of Upper Sinemurian and Lower Pliensbachian in Denmark (Michelsen 1975, p. 156).

The *Acrocythere rectangula* group of MICHELSEN, 1975
Acrocythere rectangula MICHELSEN, 1975
Pl. IV, Fig. 41

1968 *Lophocythere* sp. 865 CHRISTENSEN.–Pl. 23, Fig. 20.
1975 *Acrocythere rectangula* MICHELSEN.–Pp. 156–158, Pl. 9, Figs. 126–130; Pl. 11, Figs. 154–156.

MATERIAL.–1 complete carapace in Ör:14.

DIAGNOSIS and DESCRIPTION.–See Michelsen 1975, pp. 157–158.

DISTRIBUTION.–Lower part of Upper Sinemurian in Skåne and Denmark (Sivhed in the present paper, Michelsen 1975, p. 158).

The *Acrocythere tricostata* group of MICHELSEN, 1975
Acrocythere tricostata MICHELSEN, 1975
Pl. IV, Fig. 42

1975 *Acrocythere tricostata* MICHELSEN.–Pp. 158–160, Pl. 9, Figs. 131–142; Pl. 11, Figs. 157–158, Text-Fig. 26.
1975 *Lophodentina tricostata* (MICHELSEN).–Bate & Coleman, pp. 12–14, Pl. 6, Figs. 6–9, Text-Fig. 8.

MATERIAL.–3 complete carapaces, 3 left valves and 1 right valve in samples 620:4; Ka:778; Kä:67, 68; RF1: 71, 90 and in RF4:125.

DIAGNOSIS and DESCRIPTION.–See Michelsen 1975, p. 159.

REMARKS.–The present ostracodes have the same size range as those examined by Michelsen (1975, Text-Fig. 26), and Bate & Coleman (1975, p. 14).

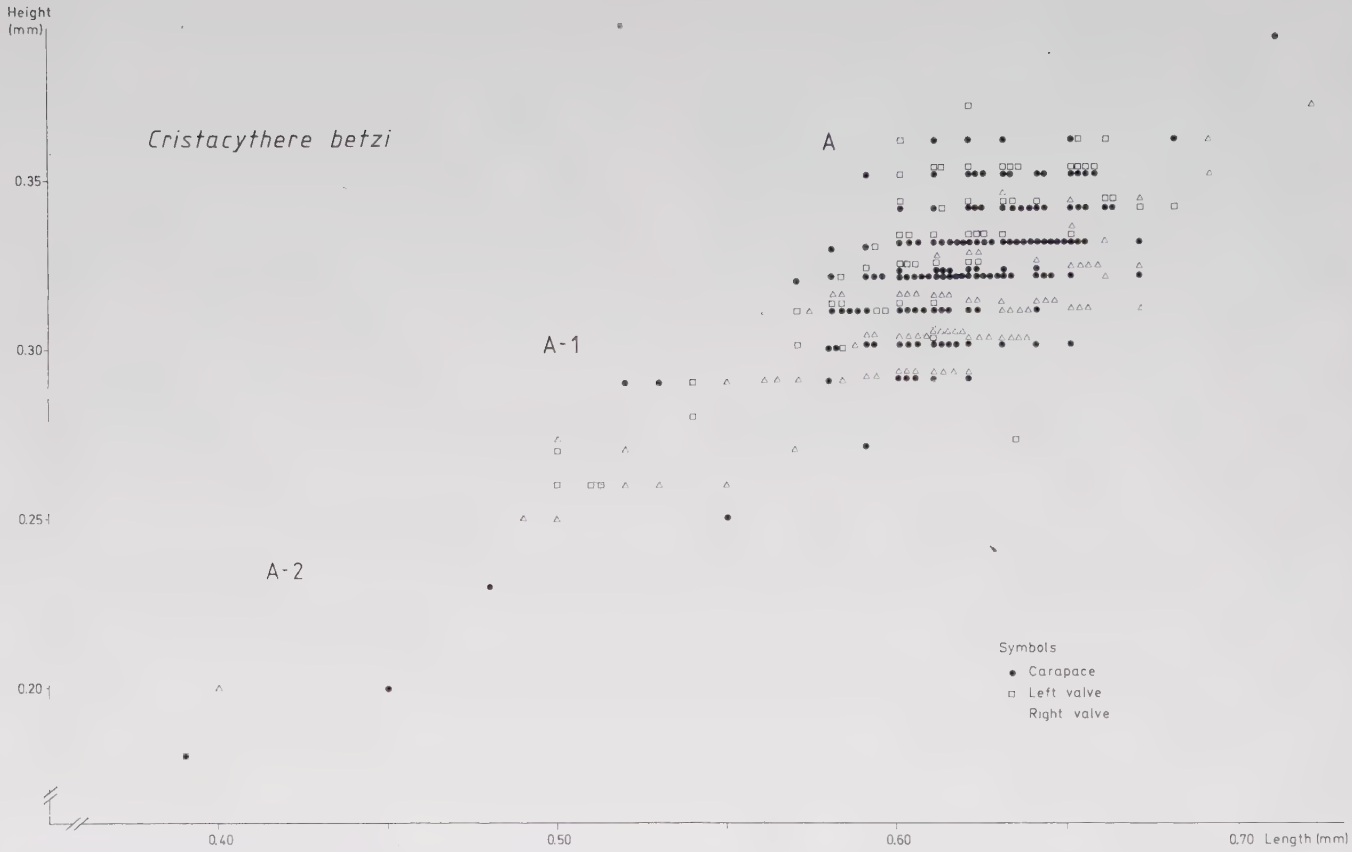


Fig. 30. Scatter diagram showing the relation between numbers, length and height of *Cristacythere betzi*. Sample No. T:66. The symbols A–A-2 represent stages of growth.

The short ridge extending down from the eye spot towards the anterior margin (Bate & Coleman 1975, p. 12) is more or less pronounced in the ostracodes examined.

DISTRIBUTION.–Lower Pliensbachian in Skåne, upper part of Upper Sinemurian, and Upper Pliensbachian in Denmark (Michelsen 1975, p. 160). Upper part of Lower Toarcian in England (Bate & Coleman 1975, Text–Fig. 1).

Genus *Cristacythere* MICHELSEN, 1975
Cristacythere betzi (KLINGER & NEUWEILER), 1959
Fig. 30; Pl. IV, Figs. 37, 40; Pl. V, Fig. 53

1959 *Procytheridea betzi* KLINGLER & NEUWEILER.–Pp. 374–376, Pl. 13, Figs. 1–5, 9.
1962 *Procytheridea betzi* KLINGLER & NEUWEILER.–Klingler, p. 80, Pl. 12, Fig. 5.
1965 *Procytheridea betzi* KLINGLER & NEUWEILER.–Dreyer, p. 503, Pl. 5, Figs. 1a–d.
1968 *Procytheridea betzi* KLINGLER & NEUWEILER.–Christensen, Pl. 23, Fig. 13.
1975 *Cristacythere betzi* (KLINGLER & NEUWEILER).–Michelsen, pp. 163–165, Pl. 10, Figs. 143–147; Pl. 11, Figs. 159–171, Text–Fig. 27.
1977 *Cristacythere betzi* (KLINGLER & NEUWEILER).–Sivhed, pp. 12–13, Pl. 1, Figs. 7–11; Pl. 2, Figs. 20–21.

MATERIAL.–186 complete carapaces, 119 left valves and 248 right valves in samples 334:63; 359:16, 17; 360:10–11, 19, 21, 23–24, 26–27; 367:11, 16, 18, 29–30; Ga:1–2, 4, 28, 34, 36, 57; T:66; Ör:21 and Öy:5–7.

DIAGNOSIS.–See Klingler & Neuweiler 1959, pp. 374, 376.

DESCRIPTION.–See Michelsen 1975, pp. 163–164.

MEASUREMENTS.–291 specimens from sample T:66 have been measured. The result is shown in Fig. 30. The largest specimen recorded is a right valve in sample No. 334:63. It is 0.78 mm long and 0.36 mm high.

REMARKS.–Adults and two instar forms were recorded from sample T:66 from which 1 000 g of sample material was treated. The treated ostracodes are slightly longer and higher than those described by Michelsen (1975, Text–Fig. 27).

DISTRIBUTION.–Sinemurian in Skåne, Lower Sinemurian and lower part of Upper Sinemurian in Denmark (Michelsen 1975, p. 165), upper part of Lower Sinemurian

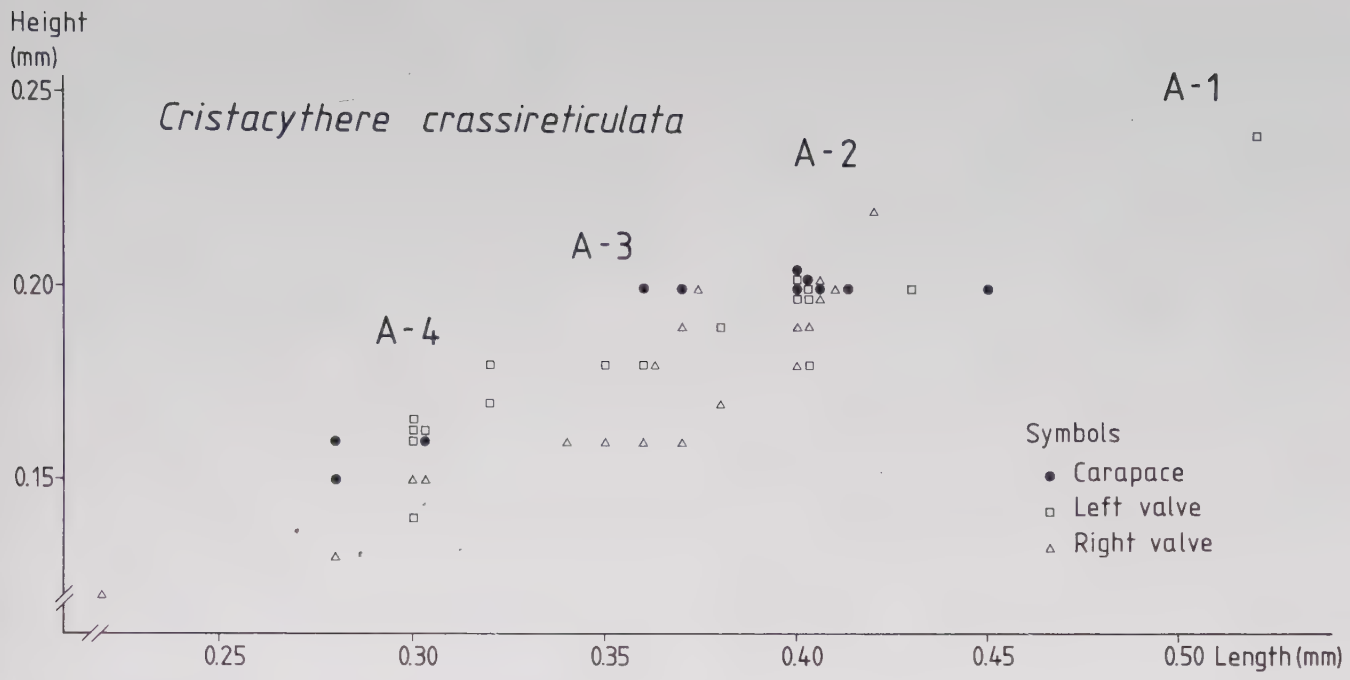


Fig. 31. Scatter diagram showing the relation between numbers, length and height of *Cristacythere crassireticulata*. Samples Nos. 359:10; 360:12, 18, 19; 841:2, 3, 4 and Ga:7, 15, 16. The symbols A-1–A-4 represent stages of growth.

and lower part of Upper Sinemurian in Northwest Germany (Klingler & Neuweiler 1959, p. 374 and Klingler 1962, p. 81), lower part of Upper Sinemurian in Northeast Germany (Dreyer 1965, p. 503), upper part of Lower Sinemurian and lower part of Upper Sinemurian in Great Britain (Lord 1978, Table 2).

Cristacythere crassireticulata MICHELSEN, 1975
Fig. 31, Pl. V, Figs. 43–44, 46, 49

1968 *Procytheridea* sp. 865 b CHRISTENSEN.–Pl. 23, Fig. 5.
1968 *Lophocythere*? sp. 654 CHRISTENSEN.–Pl. 23, Fig. 3.
1975 *Cristacythere crassireticulata* MICHELSEN.–Pp. 168–170, Pl. 10, Fig. 153; Pl. 12, Figs. 179–185.
1977 *Cristacythere crassireticulata* MICHELSEN.–Sivhed, p. 13, Pl. 2, Figs. 19, 22.

MATERIAL.–13 complete carapaces, 20 left valves and 17 right valves in samples 359:10; 360:12, 18, 19; 841:2, 3, 4 and Ga:7, 15, 16.

DIAGNOSIS and DESCRIPTION.–See Michelsen 1975, p. 169.

MEASUREMENTS.–See Fig. 31 where all the measurable specimens (47) are listed.

REMARKS.–The ornamentation in the ostracodes studied does not display such a coarse polygonal network as that described by Michelsen (1975, Pl. 10, Fig. 153; Pl. 12, Fig. 170). The difference in ornamentation could be due to the circumstance that all the treated specimens seem to be larval forms (see Fig. 31). The largest recorded specimens agree in size with the instar A-1 of Michelsen (Text–Fig. 30, pp. 170). The material treated by Sivhed (1977, p. 13) also consists of larval forms.

DISTRIBUTION.–Upper part of Lower Sinemurian to the lowermost part of the Upper Sinemurian in Skåne, Lower Sinemurian to the lowermost part of the Upper Sinemurian in Denmark (Michelsen 1975, p. 170, 1978, p. 83).

Genus *Gramannella* LORD 1972

Gramannella apostolescui (GRAMANN, 1962)
Pl. V, Figs. 45, 47–48

1962 *Procytheridea*? *apostolescui* GRAMANN.–Pp. 193–194, Pl. 3, Figs. 4–6.
1968 *Procytheridea*? aff. *P. apostolescui* GRAMANN.–Christensen, Pl. 23, Fig. 41.
1972a *Gramannella apostolescui* (GRAMANN).–Lord, pp. 193–195, Pl. 39, Figs. 14–23.
1975 *Gramannella apostolescui* (GRAMANN).–Michelsen, pp. 172–175, Pl. 12, Figs. 188–189; Pl. 13, Figs. 190–197, Text–Fig. 31.
1978 *Gramannella apostolescui* (GRAMANN).–Lord, p. 202, Pl. 3, Figs. 2, 3, Table 1.

MATERIAL.–17 complete carapaces, 33 left valves and 39 right valves in samples 334:11; 336:11–15; RF1:71, 75,

77, 82; RF4:107, 110, 123; Ka:780, 800, 812, 814, 826, 830, 945, 955; Kä:30, 44, 49, 59, 62, 64–68.

DIAGNOSIS.–See Gramann 1962, p. 193.

DESCRIPTION.–See Michelsen 1975, pp. 172–173.

REMARKS.–The investigated specimens display the same size range as those treated by Michelsen (1975, p. 173, Text–Fig. 31). Adults and one instar form were recognized in the present material. The present specimens display the same features as those described by Michelsen (1975, p. 172). The material from Denmark and Skåne differs from the German type material in having a more rounded posterior end. The British specimens described by Lord (1972a, Pl. 39, Figs. 14–23, Text-Fig. 3) have a more elongated posterior end than the German forms (Gramann 1962, p. 193). ?*Procytheridea* D COUSIN & APOSTOLESCU (1961, p. 429, Fig. 2) and *Indet. gen.* sp. 36 OERTLI & GROSSDIDIER (1961, p. 460, Table 6) are only represented by incomplete drawings. For these reasons it is difficult to evaluate these specimens. However, Oertli (1963, Pl. 16, Fig. 1) presented photographs of *Indet. gen.* sp. 36 which seems to be identical to the type of *Gramannella apostolescui* described by Lord (1972a, Pl. 39, Figs. 14–23, Text–Fig. 3).

Michelsen (1975, p. 174) suggested a division of *G. apostolescui* into two subspecies, differing in the shape of the anterior end; viz. elongated or more rounded respectively. This means that the German, Danish and present forms should belong to one subspecies, whereas the English, and probably also the French forms should belong to another subspecies, a sub-division which I support.

DISTRIBUTION.–Lower Pliensbachian in Skåne, uppermost part of Upper Sinemurian (questionably determined), Lower Pliensbachian and possibly Upper Pliensbachian in Denmark (Michelsen 1975, p. 175), upper part of the Lower Pliensbachian and the lower part of Upper Pliensbachian in Germany (Gramann 1962, p. 194), lower part of the Upper Pliensbachian in England (Lord 1972a, Text–Fig. 3; 1978, p. 207, Table 1), the uppermost Lower Pliensbachian and the Upper Pliensbachian in France (Lord 1972a, Text–Fig. 3).

Gramannella laevigata MICHELSEN, 1975
Pl. V, Figs. 50–52

1968 *Procytheridea*? sp. 895 CHRISTENSEN.–Pl. 23, Fig. 49.
1968 *Ostracod* sp. 884 CHRISTENSEN.–Pl. 12, Fig. 39.
1975 *Gramannella laevigata* MICHELSEN.–Pp. 175–176, Pl. 13, Figs. 198–200, 203; Pl. 16, Figs. 235–238.

MATERIAL.–8 complete carapaces, 8 left valves and 8 right valves in samples 334:12, 13, 19; 336:12, 14, 15; RF1:69, 89; RF4:106, 123; Kä:33, 44, 57, 60, 63, 89; Ka:830, 940, 945, 955.

DIAGNOSIS and DESCRIPTION.–See Michelsen 1975, pp. 175–176.

REMARKS.–The collapsed pore canals on the smooth external surface are a characteristic feature of the species.

DISTRIBUTION.–Lower Pliensbachian in Skåne, Lower Pliensbachian and possibly uppermost part of Upper Sinemurian in Denmark (Michelsen 1975, p. 176).

Genus *Kinkelinella* MARTIN, 1960
Subgenus *Kinkelinella (Klinglerella)* ANDERSON, 1964

Kinkelinella (Klinglerella) foveolata MICHELSEN, 1975
Pl. VI, Figs. 54, 56, 58; Pl. VII, Fig. 67

1968 *Procytheridea* aff. *P. Sulcata* KLINGLER & NEUWEILER.–Christensen, Pl. 23, Fig. 37.
1968 Ostracod (513) Wicher.–Christensen, Pl. 23, Fig. 48 (non Ostracod (513) Wicher, 1938).
1975 *Kinkelinella (Klinglerella) foveolata* MICHELSEN.–Pp. 189–192, Pl. 21, Figs. 331–335; Pl. 22, Figs. 347–352. Text-Fig. 36.
1977 *Kinkelinella (Klinglerella) foveolata* MICHELSEN.–Sivhed, pp. 15–16, Pl. 2, Figs. 15, 16, 18. Text-Fig. 6.

MATERIAL.–81 complete carapaces, 118 left valves and 25 right valves in samples 334:16, 17; 336:12, 14, 15; 358:42; 359:4; 620:9, 11; Ga:33, 53, 54; Kä:30, 62, 63, 65, 66, 67, 70, 87; Ka:756, 758, 762, 782, 784, 785, 830, 940, 945; RF1:69, 71, 89; RF4:107, 111, 119.

DIAGNOSIS and DESCRIPTION.–See Michelsen 1975, pp. 190–191.

REMARKS.–The measurements and statistical calculations agree with those given by Sivhed (1977, p. 16, Text–Fig. 6). It is worth noting that sexual dimorphism can be observed in the last two instar forms.

The three ribs behind the muscle scar area, which are commonly connected by a vertical rib, are usually a most characteristic feature. In some cases, however, there are fine horisontal ribs parallel to and in between the three ribs (cf. Pl. VI, Fig. 541). The rib anterior to the discussed ones, described as "bent like a questionmark" (Michelsen 1975, p. 191), is situated anteriorly to the discussed vertical rib. A part of the questionmark rib is commonly parallel to the discussed vertical rib.

DISTRIBUTION.–Upper Sinemurian and Lower Pliensbachian in Skåne and Denmark (Michelsen 1975, p. 192).

Kinkelinella (Klinglerella) katsloesensis n.sp.
Pl. VI, Figs. 59–63

DERIVATION OF THE NAME.–Latin *katsloesensis,* from the Katslösa area, where the type locality is situated.

HOLOTYPE.–A right valve. SGU Type 449.

TYPE LOCALITY.–Gantofta No. 841 boring.

TYPE STRATUM.–Sample No. 8. Dark claystone. Lower part of the *Cristacythere betzi–C. crassireticulata* Zone, Lower Sinemurian.

MATERIAL.–29 complete carapaces, 16 left valves and 33 right valves in samples 359:6, 13; 360:6, 7, 11, 22; 841:8, 9.

DIAGNOSIS.–A species of the subgenus *Kinkelinella (Klinglerella)* oval to subtriangular viewed laterally and with pronounced longitudinal ribs and crossribs. The longitudinal ribs are more distinct anteriorly than posteriorly.

DESCRIPTION.–The carapace is subtriangular to oval viewed laterally, tapering posteriorly, and with the largest height at the anterior cardinal angle. In dorsal view the outline is elongated and oval, with the largest width ventrally.

The dorsal margin is nearly straight and slightly concave between the obtuse cardinal angles. The anterior margin is rounded, but straight in the dorsal part. The ventral margin is straight. The posterior margin is rounded and extended ventrally and straight in the dorsal part. The hinge is straight. In the left valve it consists of elongated, notched sockets separated by a smooth bar, which is emphasized by a dorsal groove. In the right valve it consists of corresponding terminal dental areas, with seven teeth in the posterior one and five in the anterior one. The median hinge element is slightly crenulated. Radial pore canals were not observed. The muscle scar area consists of a vertical and slightly arched row of four spots. The sculpture of the lateral surfaces consists of strong ribs forming a polygonal pattern. From the anterior margin three to four ribs extend towards the mid-point of the dorsal margin and two ribs to the postero-ventral end. These ribs cross each other mid-anteriorly which results in a characteristic reticulation. There are three longitudinal ribs along the ventral margin. Medially and postero-medially the sculpture consists of four to five longitudinal ribs. Crossribs occur frequently between all the ribs. The area between the ribs is pitted. The flanges have an irregular pattern.

MEASUREMENTS.–The largest specimen, a complete carapace, measures 0.64 mm in length and 0.32 mm in height.

REMARKS.–The carapace outline and ornamentation of *Progonoidea reticulata* MICHELSEN 1975, Pl. 23, Fig. 360 (he has only recorded a few specimens) is very similar to that of the new species. Michelsen (1975, p. 218) referred his specimen tentatively to *P. reticulata*. Adult and instar forms have been recorded.

The reasons for referring the present species to the genus *Kinkelinella* and the subgenus *Klinglerella* are the broad anterior and posterior margins and the slightly longitudinal ribs.

DISTRIBUTION.–Sinemurian in Skåne.

Kinkelinella (Klinglerella) cf. *laqueata* (KLINGLER & NEUWEILER, 1959)
Pl. VI, Figs. 55, 57

cf. 1959 *Procytheridea laqueata* KLINGLER & NEUWEILER.–Pp. 382–383, Pl. 15, Figs. 37–47.
cf. 1962 *Procytheridea laqueata* KLINGLER & NEUWEILER.–Klingler, p. 85, Pl. 12, Fig. 11.
cf. 1965 *Procytheridea laqueata* KLINGLER & NEUWEILER.–Dryer, Pl. 6, Fig. 1.
cf. 1975 *Kinkelinella (Klinglerella) laqueata* (KLINGLER & NEUWEILER).–Michelsen, pp. 192–193, Pl. 20, Figs. 327–330; Pl. 22, Figs. 353–357.

MATERIAL.–1 left valve and 1 right valve in samples 360:20 and 840:6.

DIAGNOSIS and DESCRIPTION.–See Klingler & Neuweiler 1959, p. 382.

REMARKS.–The specimens studied have a rather eroded surface making a definite determination difficult. The sculpture does, however, resemble that of *Kinkelinella (Klinglerella) laqueata*. The specimens studied therefore can be tentatively referred to *Kinkelinella (Klinglerella) laqueata*.

DISTRIBUTION.–Upper part of Lower Sinemurian and lower part of Upper Sinemurian in Skåne, lower part of Upper Sinemurian in Denmark (Michelsen 1975, p. 193) and lower part of Upper Sinemurian in Germany (Klingler & Neuweiler 1959, p. 382).

Kinkelinella (Klinglerella) triebeli (KLINGLER & NEUWEILER, 1959)
Pl. VII, Fig. 68

1959 *Procytheridea triebeli* KLINGLER & NEUWEILER.–Pp. 381–382, Pl. 13, Figs. 11–16; Pl. 14, Figs. 7–8.
1962 *Procytheridea triebeli* KLINGLER & NEUWEILER.–Klingler, p. 84, Pl. 12, Fig. 12.
1968 *Procytheridea vulgaris* KLINGLER & NEUWEILER.–Christensen, Pl. 23, Fig. 19 (non *Procytheridea vulgaris* KLINGLER & NEUWEILER, 1959).
1975 *Kinkelinella (Klinglerella) triebeli* (KLINGLER & NEUWEILER).–Michelsen, pp. 187–188, Pl. 15, Figs. 218–220; Pl. 16, Figs. 245–247.
1977 *Kinkelinella (Klinglerella) triebeli* (KLINGLER & NEUWEILER).–Sivhed, p. 15, Pl. 3, Figs. 25–26.

MATERIAL.–9 complete carapaces, 3 left valves and 6 right valves in samples Ga:29, 30, 35, 51 and RFl:123.

DIAGNOSIS and DESCRIPTION.–See Klingler & Neuweiler 1959, pp. 381–382.

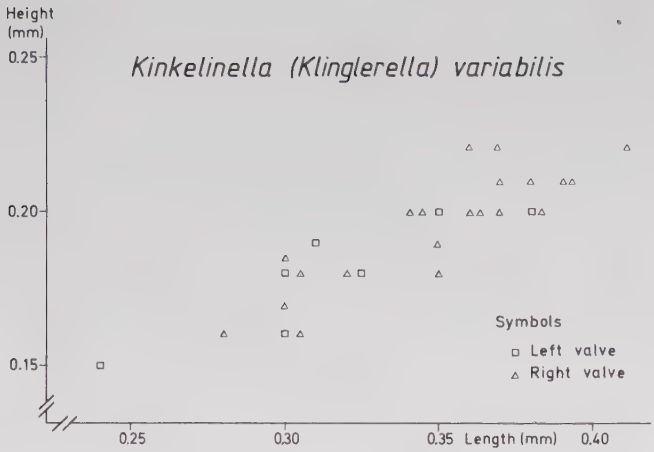


Fig. 32. Scatter diagram showing the relation between numbers, length and height of *Kinkelinella (Klinglerella) variabilis*. Sample No. RF4:125.

REMARKS.–The specimens investigated are equal in size to those described by Michelsen (1975, Pls. 15 and 16). They are however, smaller than those described by Klingler and Neuweiler (1959, p. 382). The more elongated form with more pronounced longitudinal ribs described as *Kinkelinella (Klinglerella)* cf. *triebeli* KLINGLER & NEUWEILER, 1959 by Michelsen (1975, p. 188) has not been recorded.

DISTRIBUTION.–Upper Sinemurian in Skåne, lower part of Upper Sinemurian in Denmark (Michelsen 1975, p. 188), lower part of Upper Sinemurian in Germany (Klingler & Neuweiler 1959, p. 381).

Kinkelinella (Klinglerella) variabilis (KLINGLER & NEUWEILER, 1959)
Fig. 32; Pl. VII, Figs. 64–65, 73

1959 *Procytheridea variabilis* KLINGLER & NEUWEILER.–Pp. 388–390, Pl. 21, Figs. 336–338; Pl. 24, Figs. 373–377.
1962 *Procytheridea variabilis* KLINGLER & NEUWEILER.–Klingler, p. 89, Pl. 12, Fig. 18.
1975 *Kinkelinella (Klinglerella) variabilis* (KLINGLER & NEUWEILER).–Michelsen, pp. 193–194, Pl. 21, Figs. 336–338; Pl. 24, Figs. 373–377.

MATERIAL.–38 left valves and 31 right valves in samples Nos. 620:35, 40; Ka:756, 758 and RF4:123, 125.

DIAGNOSIS and DESCRIPTION.–See Klingler & Neuweiler 1959, p. 389.

MEASUREMENTS.–The length and height of twenty-eight specimens in sample No. RF4:125 are given in Fig. 32. The largest specimen measured, a left valve in sample Ka:756, is 0.46 mm long and 0.27 mm high.

REMARKS.–The present ostracodes are, as those described by Michelsen (1975, Pls. 21, 24), smaller than specimens described by Klingler & Neuweiler (1959, p. 390). Probably only instar forms have been recorded by Michelsen and me.

The longitudinal rib, running mid-posteriorly to about medianly, is a characteristic feature in the Swedish forms.

DISTRIBUTION.–Uppermost part of Upper Sinemurian and lower part of Lower Pliensbachian in Skåne, upper part of Upper Sinemurian in Denmark (Michelsen 1975, p. 194), and Germany (Klingler & Neuweiler 1959, p. 388 and Klingler 1962, p. 89).

Genus *Nanacythere* HERRIG, 1969
Subgenus *Nanacythere (Goniocythere)* MICHELSEN, 1975

Nanacythere (Goniocythere) bachi (GRAMANN, 1962)
Pl. VII, Figs. 69, 70

1954 *Cythereis nana* BACH.–Pp. 112–114, Pl. 1, Figs. 8a–b, 9; Pl. 10, Figs. 3a–b, 4, 5.
1962 *Lophodentina*? *bachi* GRAMANN.–Pp. 194–195, Text–Fig. 2, Pl. 2, Figs. 5a–c.
1968 *Lophodentina*? *bachi* GRAMANN.–Christensen, Pl. 23, Fig. 43.
1975 *Nanacythere*? *bachi* (GRAMANN).–Michelsen, pp. 211–212. Pl. 20, Figs. 315–319.

MATERIAL.–4 complete carapaces, 2 left valves and 3 right valves in samples Ka:774, 778, 790; Kä:29; RF1:82 and RF4:119.

DIAGNOSIS and DESCRIPTION.–See Gramann 1962, pp. 194–195.

MEASUREMENTS.–All the specimens have been measured. They can be divided into (A) an adult form, and one instar form (A–?). The adults measure 0.29–0.35 mm in length and 0.16–0.18 mm in height. The instar form (one specimen) is 0.15 mm in length and 0.08 mm high.

REMARKS.–The adult form studied is larger than the holotype (the holotype is 0.22 mm long and 0.11 mm high) and also larger than the specimens determined by Michelsen (1975, p. 212). The recorded instar is the same in carapace outline as Gramann's specimens (1962). This confirms Michelsen's (1975, p. 212) opinion that the holotype is a larval form. His specimens are slightly smaller than the present adults.

As mentioned by Michelsen (1975, p. 212), the shape and size of the carapace, the main character of the sculpture, the features of the dorsal margin and the inner lamella are characteristics of the subgenus *Nanacythere (Goniocythere)*. The hinge is merodont. Taken together, these facts indicate that the present species belong to the subgenus *Nanacythere (Goniocythere)*.

DISTRIBUTION.–Lower Pliensbachian in Skåne, Lower Pliensbachian in Denmark (Michelsen 1975, p. 212) and in Germany (Gramann 1962, p. 195).

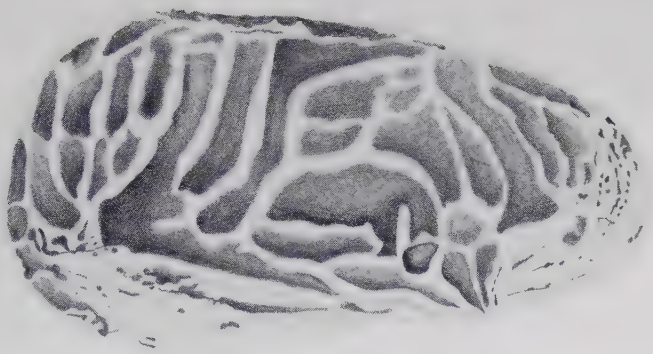


Fig. 33. Drawing of *Nanacythere (Goniocythere) ventricosta* n. sp. Carapace, left side, holotype. Sample No. 358:42 (X225). SGU Type 462.

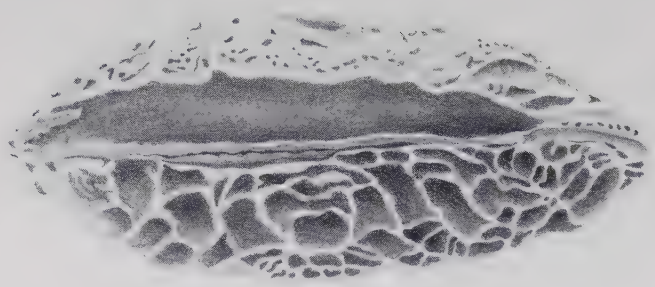


Fig. 34. Drawing of *Nanacythere (Goniocythere) ventricosta* n. sp. Carapace, dorsal view. Sample No. 358:42 (X260). SGU Type 456.

Nanacythere (Goniocythere) minor MICHELSEN, 1975
Pl. VII, Figs. 71–72

1968 *Monoceratina* sp. 885 CHRISTENSEN.–Pl. 23, Fig. 34.
1975 *Nanacythere (Goniocythere) minor* MICHELSEN.–Pp. 207–209, Pl. 18, Figs. 284–285; Pl. 19, Figs. 303–307.

MATERIAL.–2 left valves and 5 right valves in samples Ga:13, Ka:800 and RFl:75, 82.

DIAGNOSIS and DESCRIPTION.–See Michelsen 1975, pp. 208–209.

DISTRIBUTION.–Lower Sinemurian and Lower Pliensbachian in Skåne, Upper Sinemurian, Lower Pliensbachian and possibly also Upper Pliensbachian in Denmark (Michelsen 1975, p. 209).

Nanacythere (Goniocythere) ventricosta n.sp.
Figs. 33, 34; Pl. VII, Fig. 66; Pl. VIII, Figs. 74–75

1977 *Nanacythere (Goniocythere) circumcostata* MICHELSEN.–Sivhed, pp. 16–18. Pl. 2, Fig. 12.

DERIVATION OF THE NAME.–Latin *venter,* ventral side, and *costa,* rib, referring to the ventral ridge.

HOLOTYPE.–A carapace, SGU Type 462.

TYPE LOCALITY.–The Gantofta No. 358 core drilling.

TYPE STRATUM.–Sample No. 42. Dark grey claystone. The *Ogmoconchella danica* Zone, the lowermost part of the Upper Sinemurian.

MATERIAL.–57 complete carapaces, 4 left valves and 10 right valves in samples 334:60, 62; 358:42; 359:10, 17; 360:8, 9, 10, 17, 18, 19, 21, 27; 367:18; Ga:13, 15, 16, 34, 36, 45; Ör:38.

DIAGNOSIS.–A species of *Nanacythere (Goniocythere)* with vertical parallel ribs laterally, diverging medianly to mid-ventrally and with a postero-ventral ridge.

DESCRIPTION.–The carapace is small. It is elongated and subtriangular in lateral view, with its largest height at the anterior cardinal angle. The outline in dorsal view is elongated and oval, with the largest width posterior to the mid-point and with a concavity at the mid-point. In posterior view, it is subtriangular with the largest width ventrally. The dorsal margin is straight to concave in the left valve and straight to slightly convex in the right one. The anterior cardinal angle is distinct whereas the posterior one is indistinct. The ventral margin is straight with a postero-ventral ridge. The anterior margin is broadly rounded with sharp arcs dorsally and ventrally. The posterior margin is evenly rounded and slightly extended dorsally. The lateral surfaces have a slight concavity behind the anterior cardinal angle. The flanges are narrow.

The right valve is slightly smaller than the left one, but overlaps the latter along the dorsal margin.

The sculpture on the lateral surfaces consist of rather strong vertical ribs diverging medially to mid-ventrally. A short horisontal rib extends between the diverging ribs. Fine cross-ribs occur between the strong ribs. The longitudinal ribs are weakly ornamented.

MEASUREMENTS.–The carapaces in sample No. 361:21 have given the following measurements:

	X	S	OR	N
Length	0.32	0.007	0.31–0.34	14
Height	0.15	0.011	0.14–0.17	14

X = mean, S = standard deviation, OR = observed range, N = number of carapaces.

REMARKS.–*Nanacythere ventricosta* resembles *N. circumcostata* MICHELSEN, 1975 and *N. paracostata* MICHELSEN, 1975. The sculpture of *N. ventricosta* is intermediate between *N. circumcostata* and N. *paracostata.* A characterstic feature of *N. ventricosta* is the postero-ventral ridge. *N. circumcostata* of Sivhed (1977, p. 17–18) are referred to *N. ventricosta.*

DISTRIBUTION.–Uppermost part of Lower Sinemurian to lower part of Upper Sinemurian in Skåne.

Genus *Pleurifera* GRAMANN, 1962

Pleurifera harpa (KLINGLER & NEUWEILER, 1959)
Pl. VII, Figs. 77–81

1959 *Procytheridea harpa* KLINGLER & NEUWEILER.–Pp. 396–397, Pl. 18, Figs. 87, 91–92, 95–96.
1962 *Procytheridea (Pleurifera) harpa* (KLINGLER & NEUWEILER).–Gramann, pp. 189–190, Pl. 1, Fig. 6, Text–Fig. 1.
1968 *Procytheridea harpa* KLINGLER & NEUWEILER.–Christensen, Pl. 23, Fig. 36.
1975 *Pleurifera harpa* (KLINGLER & NEUWEILER).–Michelsen, pp. 214–216, Pl. 21, Figs. 339–341; Pl. 24, Figs. 378–380.
1978 *Pleurifera harpa* (KLINGLER & NEUWEILER).–Lord, p. 22, Pl. 3, Fig. 1, Table 1.

MATERIAL.–5 complete carapaces, 32 left valves and 33 right valves in samples 334:17, 19, 20; 336:15, 21; 620:4, 5, 6, 7, 9, 12, 14, 15, 24, 25, 26, 27; Ka:768, 776, 780, 784, 785, 830; Kä:62, 66, 67, 68, 70, 71, 84; RFl:71; RF4:104, 107, 119, 122, 123.

DIAGNOSIS and DESCRIPTION.–See Klingler & Neuweiler 1959, p. 396.

MEASUREMENTS.–The complete carapaces referred to the adult form are 0.57–0.62 mm long and 0.27–0.32 mm high.

REMARKS.–Adult and three instar forms have been recorded. The specimens examined are of about the same size as the specimens studied by Michelsen (1975, p. 215). Some of the adults in the present material, however, are smaller than those investigated by Michelsen (1975, p. 215). The type material (Klingler & Neuweiler 1959, p. 397) includes specimens which are longer and higher than the discussed Swedish and Danish forms.

Gramann (1962, p. 189) studied the radial pore canals in northwest German specimens of *Pleurifera harpa*. These forms exhibit seven to eight radial pore canals anteriorly and three posteriorly. Some of the specimens from the Katslösa section (Ka:776) and from boring No. 620 (620:9, 26) are hyaline which makes an examination of the radial pore canals possible. Only adults (A) have been studied. The number of radial pore canals varies, eight to eleven anteriorly and three to four posteriorly. There is no co-variation between the number of radial pore canals and the size of the carapace. The type of sediment is about the same in all the samples (dark grey clay).

DISTRIBUTION.–Uppermost part of Upper Sinemurian and Lower Pliensbachian in Sweden, Lower Pliensbachian in Denmark (Michelsen 1975, p. 215). Upper Sinemurian and Lower Pliensbachian in northern Germany (Klingler & Neuweiler 1959, p. 397, Gramann 1962, p. 190). Lower Pliensbachian in southern Germany (Klingler 1962, p. 93). Lowermost Pliensbachian (*Uptonia jamesoni* Zone) in France (Viaud 1963) and upper part of Lower Pliensbachian in England (Lord 1978, Table 1).

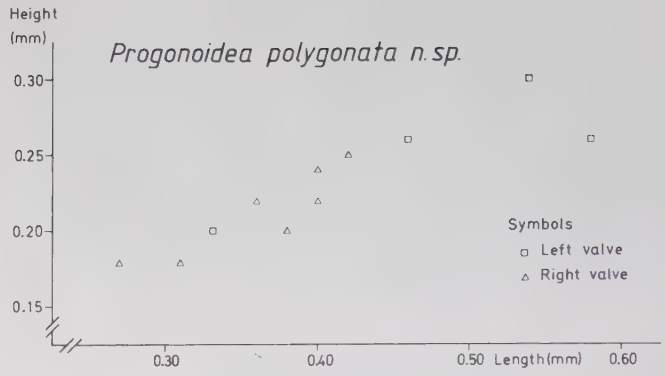


Fig. 35. Scatter diagram showing the relation between numbers, length and height of *Progonoidea polygonata* n.sp. Sample No. 359:8.

Genus *Prognoidea* GRAMANN, 1962

Progonoidea polygonata n.sp.
Figs. 35–37, Pl. VIII, Figs. 76, 82

DERIVATION OF THE NAME. – Greek *polys,* many and *gony,* angle referring to the ornamentation.

HOLOTYPE. – SGU Type 464.

TYPE LOCALITY. – Pankarp-Strövelstorp No. 334 core drilling.

TYPE STRATUM. – Sample No. 67. Sandy clay. The upper part of the *Cristacythere betzi–C. crassireticulata* Zone, uppermost Lower Sinemurian.

MATERIAL. – 5 complete carapaces, 8 left valves and 15 right valves in samples 334:67; 359:8; 360:16; 367:23, 24, 25; Ga:30 and Ör:22, 23.

DIAGNOSIS. – A species of Progonoidea, oval in lateral view and with a fine reticulate ornamentation forming sharply angular tetragonal and pentagonal depressions.

DESCRIPTION. – The outline of the carapace in lateral view is oval with the largest height at the anterior cardinal angle. In dorsal view the carapace is oval, with marked flanges at both ends, and with the largest width posteriorly. In posterior view it is subtriangular, concave ventrally and with the largest width ventrally. The dorsal margin is straight with a concavity directly posterior to the anterior cardinal angle. The cardinal angles are weakly marked. The anterior and posterior margins are well rounded. The right valve is smaller than the left one.

The hinge is straight. In the right valve it consists of 5 teeth anteriorly and an unknown number of teeth posteriorly. The two groups of teeth are separated by a weakly

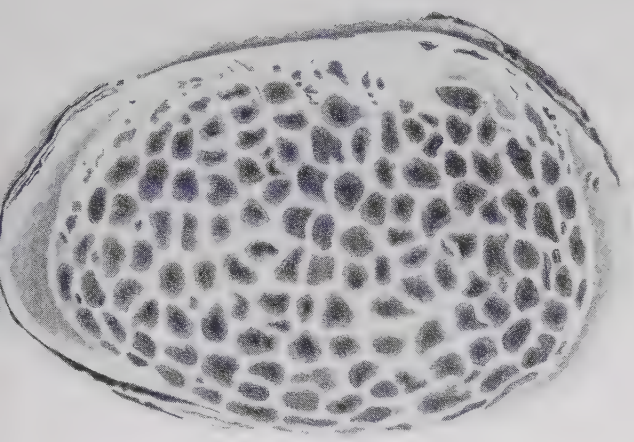


Fig. 36. Drawing of *Progonoidea polygonata* n. sp. Carapace, right side, holotype. Sample No. 334:67 (X195). SGU Type 464.

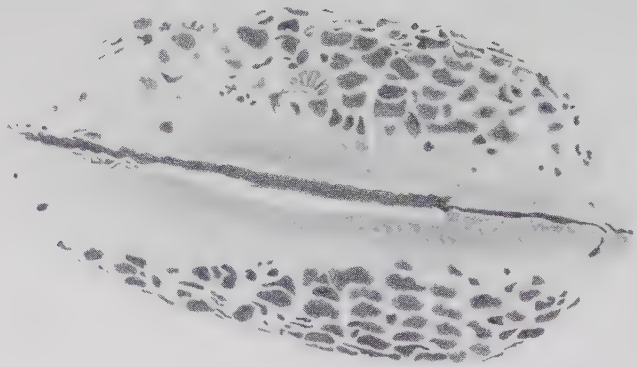


Fig. 37. Drawing of *Progonoidea polygonata* n. sp. Carapace, dorsal view, holotype. Sample No. 334:67 (X195). SGU Type 464.

crenulated median hinge element.

The sculpture is a uniform network of sharply angular tetragonal and pentagonal depressions. The flanges are weakly ornamented. A zone immediately posterior to the anterior cardinal angle is weakly ornamented. Sexual dimorphism has been observed. The specimens interpreted as males are longer and more oval than the females.

MEASUREMENTS. – See Fig. 35, p. 52.

REMARKS. – It has not been possible to study pore canals, muscle scars or posterial hinge elements.

DISTRIBUTION. – Uppermost part of Lower Sinemurian and lowermost part of Upper Sinemurian in Skåne.

Progonoidea reticulata (KLINGLER & NEUWEILER, 1959)
Pl. VIII, Fig. 83; Pl. IX, Figs. 84, 85

1959 *Procytheridea reticulata* KLINGLER & NEUWEILER.–Pp. 378–379, Pl. 14, Figs. 19–21, 23–25.
1962 *Procytheridea reticulata* KLINGLER & NEUWEILER.–Klingler, p. 82, Pl. 12, Fig. 17.
1965 *Procytheridea reticulata* KLINGLER & NEUWEILER.–Dreyer, p. 503, Pl. 5, Figs. 2a–d.
1968 *Procytheridea reticulata* KLINGLER & NEUWEILER.–Christensen, Pl. 23, Fig. 14.
1975 *Progonoidea reticulata* (KLINGLER & NEUWEILER).–Michelsen, pp. 217–219, Pl. 23, Figs. 359–363; Pl. 24, Figs. 383–385.

MATERIAL.–1 complete carapace, 4 left valves and 4 right valves in samples 334:48; 367:19; 840:6; Ör:21, 26.

DIAGNOSIS and DESCRIPTION.–See Klingler & Neuweiler 1959, pp. 378–379 and supplementary description by Michelsen (1975, p. 218).

REMARKS.–The intercostal ornamentation and the carapace outline in the present specimens are the same as in those studied by Michelsen (1975, p. 218).

The largest valve, a right male valve, is of the same size as given by Klingler & Neuweiler (1959, p. 379) and Michelsen (1975, p. 218). The Ørslev No. 1 ostracodes, however, are larger.

DISTRIBUTION.–Lowermost Upper Sinemurian in Skåne, Denmark and northern Germany (Michelsen 1975, p. 218, Klingler & Neuweiler 1959, p. 378 and Dreyer 1965, p. 503).

Suborder METACOPINA SYLVESTER-BRADLEY, 1961
Superfamily HEALDIACEA HARLTON, 1933
Family HEALDIIDAE HARLTON, 1933
Genus *Ogmoconcha* TRIEBEL, 1941

Ogmoconcha amalthei amalthei (QUENSTEDT, 1858)
Pl. IX, Figs. 86, 89, 91

1858 *Cypris amalthei* QUENSTEDT.–Pp. 164, 200, Pl. 24, Fig. 37a.
1950 *Ogmoconcha amalthei* (QUENSTEDT). – Triebel, pp. 118–120, Pl. 1, Figs. 1–5; Pl. 2, Figs. 13–17.
1959 *"Ogmoconcha" amalthei* (QUENSTEDT).–Apostolescu, p. 805, Pl. 1, Figs. 12–13.
1965 *Ogmoconcha amalthei amalthei* (QUENSTEDT).–Dreyer, pp. 497–498, Pl. 1, Figs. 2a-e.
1967 *Ogmoconcha amalthei* (QUENSTEDT).–Donze, pp. 74–75, Pl. 1, Figs. 9–12.
1975 *Ogmoconcha amalthei amalthei* (QUENSTEDT).–Michelsen, pp. 225–227, Pl. 25, Figs. 391–394; Pl. 26, Figs. 397–399, Text-Fig. 37.

MATERIAL.–127 complete carapaces, 70 left valves and 87 right valves in samples 334:14, 19; 336:8; 620:6–10, 13, 14, 18–21, 23–25, 27; Ka:762, 766, 768, 775, 778, 782, 784, 790, 794, 814, 816, 826, 830, 925, 935, 940, 955, 970; Kä:63, 64, 66, 67, 68, 70, 77; RF1:69, 71, 77, 79, 82, 83, 89; RF4:107, 109, 111, 112, 113, 116, 118, 119, 122, 123, 125.

DIAGNOSIS and DESCRIPTION.–See Triebel 1950, p. 118.

REMARKS.–The dorsal margin in several specimens resembles that of *Ogmoconcha contractula*. Some specimens are "disc-shaped" in posterior view, a feature also characteristic of *Ogmoconcha contractula*. On the other hand, the concavity outside the adductor muscle scar, an important characteristic in *Ogmoconcha contractula*, is missing. Due to this concavity the carapace of *O. contractula* has a weak concavity in posterior view (Triebel 1941, p. 379). As the present specimens lack this concavity they cannot be referred to *O. contractula*. Some specimens appear to be transitional forms between *Ogmoconcha amalthei amalthei* and *Ogmoconcha amalthei rotunda*. Such specimens have a relatively rounded dorsal margin and an edge between the lateral and ventral surfaces is missing. Larval forms are usually "disc-shaped" in posterior view, whereas adult forms are usually subtriangular or triangular in outline.

All the above-mentioned forms are referred to *Ogmoconcha amalthei amalthei*. The variation is not connected with the stratigraphical level.

The characteristics commented on above are also found in the material studied by Michelsen (1975, pp. 224, 226).

DISTRIBUTION.–Lower Pliensbachian in Skåne, Lower and Upper Pliensbachian in Denmark (Michelsen 1975, p. 226), Upper Pliensbachian in southern Germany (Triebel 1950, p. 379) and northern Germany (Dreyer 1965, p. 498), Upper Sinemurian and Pliensbachian in France (Apostolescu 1959, p. 805, Bizon & Oertli 1961, p. 117, Oertli & Grosdidier 1961, p. 460, Donze 1967, p. 74).

Genus *Ogmoconchella* GRÜNDEL, 1964

Ogmoconchella aequalis (HERRIG, 1969)

Fig. 38, Pl. IX, Figs. 88, 90, 92, 93; Pl. XI, Fig. 109; Pl. XII, Fig. 116

1965 *Ogmoconcha adenticulata* (PIETRZENUK).–Dreyer, Pl. 4, Fig. 5 (non *O. adenticulata* PIETRZENUK, 1961).
1969a *Ogmoconcha aequalis* HERRIG.–Pp. 460–464, Text–Figs. 11–15, Pl. 1, Figs. 1–4; Pl. 3, Figs. 3–6.
1975 *Ogmoconchella aequalis* (HERRIG).–Michelsen, pp. 236–238, Pl. 31, Figs. 441–445; Pl. 31, Figs. 446–449, Text–Fig. 40.

MATERIAL.–11 complete carapaces, 3 left valves and 7 right valves in samples Kä:30; RF1:69, 71; RF4:118, 123.

DIAGNOSIS and DESCRIPTION.–See Herrig 1969a, pp. 460, 462–463.

MEASUREMENTS.–All the specimens recorded have been measured; the results are presented in Fig. 38.

REMARKS.–The size range of the investigated specimens agrees with that given by Herrig (1969a, Text-Fig. 13) and Michelsen (1975, Text–Fig. 40) except for the material from Flyveberg No. 1 drill-core. In the Flyveberg No. 1 drill-core Michelsen (1975, Text-Fig. 40) recorded specimens with a maximum length of 0.90 mm and a maximum height of 0.65 mm, viz. larger than any of my specimens. Michelsen (1975, p. 239) stated that only adult forms occur in the Flyveberg No. 1 drill-core.

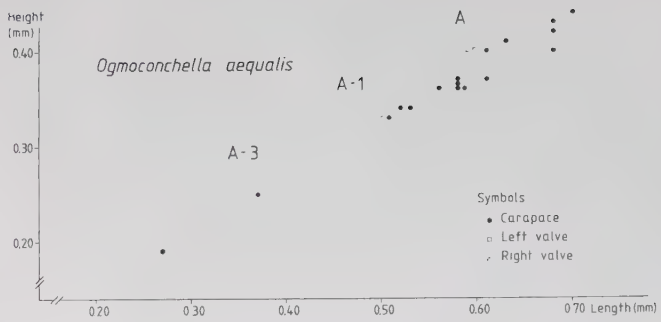


Fig. 38. Scatter diagram showing the relation between numbers, length and height of *Ogmoconchella aequalis*. Samples Nos. Kä:30; RF1:69, 71; RF4:118, 123. The symbols A–A-3 represent the stages of growth.

Most of the specimens recorded from Rydebäck-Fortuna Nos. 1 and 4 drill-cores have a weak lateral concavity. Michelsen (1975, p. 239) observed the same feature in his forms from the Öresund No. 3 drill-core. In his opinion this feature is due to local ecological circumstances. In the Swedish material, samples Kä:30, RF1:71, RF4:118, 123 have yielded the morphological type discussed whereas sample RF1:69 contains only the normal *O. aequalis* (both types have yielded adults and instars). The sediment type in the first three samples mentioned is silt and sand, while sample RF1:69 consists of clay. This fact might confirm an environmental influence on the carapace outline.

DISTRIBUTION.–Lower Pliensbachian in Skåne, Lower and Upper Pliensbachian in Denmark (Michelsen 1975, p. 238), Upper Pliensbachian in Germany (Herrig 1969a, p. 460, Malz 1971, Pl. 3).

Ogmoconchella bispinosa (GRÜNDEL, 1964)

Pl. IX, Fig. 87; Pl. X, Figs. 94, 97

1962 *Ostracod* Nr. 5 KLINGLER.–P. 83, Pl. 12, Fig. 8; Table 7.
1964a *Pseudohealdia? bispinosa* GRÜNDEL.–Pp. 472–473, Figs. 13–15.
1967 *Pseudohealdia? bispinosa* GRÜNDEL.–Donze, p. 77, Pl. 2, Figs. 34–35.
1968a *Ostracod* Nr. 5 KLINGLER.–Christensen, Pl. 23, Fig. 42.
1969a *Ogmoconcha bispinosa* GRÜNDEL.–Herrig, pp. 457–460, Text-Figs. 3–4, 7–10; Pl. 2, Figs. 4–8; Pl. 3, Figs. 1–2.
1970 *Healdia bispinosa* (GRÜNDEL).–Gründel, p. 47, Text-Fig. 1, Pl. 1, Figs. 11–13.

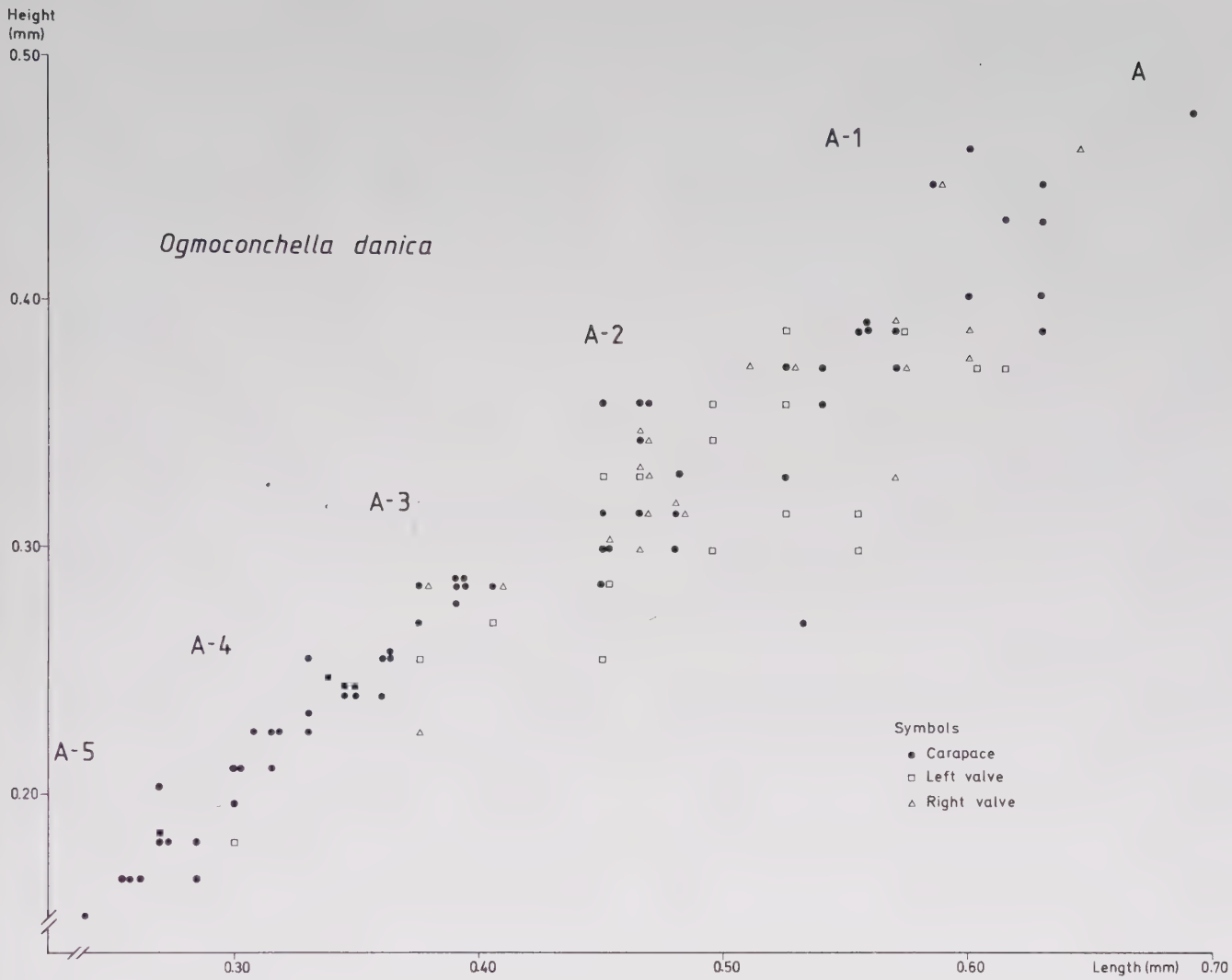


Fig. 39. Scatter diagram showing the relation between numbers, length and height of *Ogmoconchella danica*. Sample No. 367:22. The symbols A–A-5 represent stages of growth.

1975 *Ogmoconchella bispinosa* (GRÜNDEL).–Michelsen, p. 243, Pl. 31, Fig. 455; Pl. 33, Figs. 472–475.
1978 *Pseudohealdia bispinosa* GRÜNDEL.–Lord, p. 198, Pl. 1, Figs. 9, 10, Table 1.

MATERIAL.–26 complete carapaces, 2 left valves and 5 right valves in samples 336:14; 620:7, 18, 19, 21, 35; Ka:756, 762, 768, 778, 782, 812; Kä:69, 83; RF1:71.

DIAGNOSIS.–See Gründel 1964a, p. 472.

DESCRIPTION.–See Gründel 1964a, p. 472 and Herrig 1969a, p. 457.

REMARKS.–The present material consists of larval forms only. The largest recorded specimen is shown in Pl. IX, Fig. 87. In the Swedish specimens the postero-ventral spines are very thin. They are thinner than those of corresponding instar forms studied by Herrig (1969a, Text-Fig. 10) and by Donze (1967, Pl. 2, Figs. 34–35). *Ostracod* Nr. 5 KLINGLER 1962 seems to be identical to the instar forms of Herrig (1969a, Text-Fig. 10). Its spines are thicker than those in the present material.

The species is referred to the genus *Ogmoconchella* on the same grounds as given by Michelsen (1975, p. 243).

DISTRIBUTION.–Upper part of Upper Sinemurian and Lower Pliensbachian in Skåne, Pliensbachian in Denmark (Michelsen 1975, p. 243). Upper Sinemurian and Pliensbachian in Germany (Gründel 1964a, p. 473 and 1970, p. 48, Herrig 1969a, p. 458, Klingler 1962, p. 83). The Upper Sinemurian to the Lower Pliensbachian (Donze 1967, p. 77) in France and lower part of the Upper Pliensbachian in England (Lord 1978, Table 1).

Ogmoconchella danica MICHELSEN, 1975
Pl. X, Figs. 95–96, 98–102; Pl. XI, Fig. 110; Fig. 39

1975 *Ogmoconchella danica* MICHELSEN.–Pp. 243–247, Pl. 31, Figs. 451–453; Pl. 32, Figs. 456–462; Pl. 33, Figs. 476–484;

Pl. 34, Figs. 485–489; Pl. 41, Figs. 547–577, Text-Figs. 42–43.

1977 *Ogmoconchella danica* MICHELSEN.–Sivhed, pp. 18–19, Pl. 3, Figs. 31–33.

MATERIAL.–345 complete carapaces, 73 left valves and 96 right valves in samples 334:14, 58, 64; 336:10, 27; 358:45; 359:4, 5, 6, 7; 360:7, 11, 12, 13, 14, 15; 367:11, 21, 22; 620:23, 33, 156; 840:6; Ga:16, 18, 24, 25, 26, 28, 29, 30, 37; Ka:762, 774, 788, 790, 800, 935, 940; Kä:41, 61, 62; RF1:71, 89, 90, 127; Ör:21, 26, 28.

DIAGNOSIS and DESCRIPTION.–See Michelsen 1975, p. 244.

MEASUREMENTS.–The specimens in sample No. 367:22 have been measured. Fig. 39 shows the relation between number, length and height.

REMARKS.–There is a variation in size and carapace outline in the present material. Some of the specimens are more elongated in lateral view than the holotype (Michelsen 1975, Pl. 33, Figs. 476–477). The Swedish specimens also have a straight postero-dorsal margin whereas the holotype has a rounded one.

Specimens from the Katslösa Member are larger than those from the Döshult and Pankarp Members. The largest specimens from the former stratigraphic level are 0.80–0.85 mm long and 0.50–0.60 mm high, while the largest specimens from the Döshult and Pankarp Members are 0.70–0.75 mm long and 0.45–0.52 mm high. These observations are identical with those made by Michelsen (1975, p. 245) in his material and they confirm his suggestion that the variation in size is connected with the stratigraphic level.

DISTRIBUTION.–Upper Sinemurian to lower part of Lower Pliensbachian in Skåne, Upper Sinemurian and Lower Pliensbachian and only rarely in the lower part of Upper Pliensbachian in Denmark (Michelsen 1975, p. 247; 1978, p. 83).

"Ogmoconchella" mouhersensis (APOSTOLESCU, 1959)
Fig. 40, Pl. XI, Figs. 103–108, Pl. XII, Figs. 111–113

1959 *"Ogmoconchella" mouhersensis* APOSTOLESCU.–P. 805, Pl. 2, Figs. 18–19.

1975 *"Ogmoconchella mouhersensis"* APOSTOLESCU.–Michelsen, pp. 248–249, Pl. 32, Figs. 465–466; Pl. 34, Figs. 494–496; Pl. 35, Figs. 497–502, Text-Fig. 42.

MATERIAL.–151 complete carapaces, 81 left valves and 121 right valves in samples 334:11, 15, 19, 36; 336:11, 13, 14, 15, 21; 620:4, 5, 6, 8, 12, 13, 14, 15, 16, 17, 18, 21, 23, 24, 26, 27, 29, 30, 31, 45; RF1:69, 71, 82, 89, 90; RF4:104, 107, 109, 110, 111, 113, 116, 119, 122, 123; Ka: 762, 766, 775, 776, 778, 782, 788, 794, 800, 812, 830, 925; Kä:29, 30, 34, 41, 44, 50, 52, 53, 54, 61, 62, 63, 65, 67, 68, 69, 70, 71.

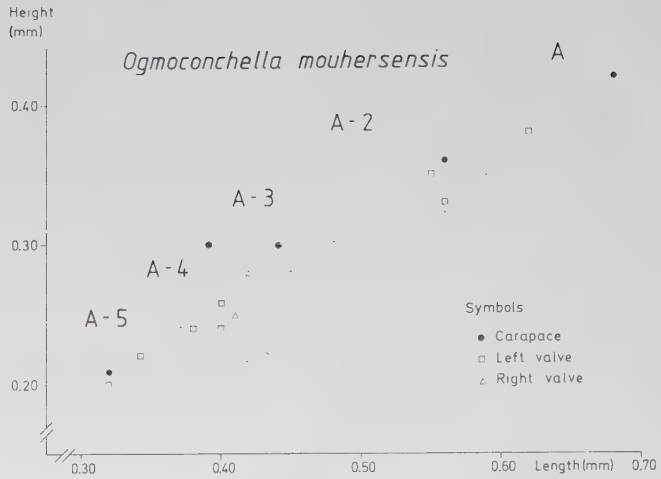


Fig. 40. Scatter diagram showing the relation between numbers, length and height of *"Ogmoconchella" mouhersensis*. Sample No. 336:14. The symbols A–A-5 represent stages of growth.

DIAGNOSIS. (EMEND.).–A species of *Ogmoconchella* with subtriangular outline in lateral view. Anterior end well rounded and slightly extended ventrally. Posterior end angular. External surface smooth.

DESCRIPTION (EMEND.).–In lateral view the outline is subtriangular with the largest height just behind the mid-point. The outline in dorsal view is elongated with the largest width one sixth from the posterior margin.

The dorsal margin is arched just behind the mid-point. The dorsal margin is slightly convex from the bend to the rounded, ventrally elongated anterior margin. The dorsal margin is straight posteriorly. The posterior margin is angled, with the angle at half of the height of the carapace. The straight dorsal margin fits into the angle and ventrally the posterior end is slightly convex and fits with a slight bend into the slightly concave ventral margin. The anterior margin fits with a bend into the ventral margin.

Laterally there is a vertical postero-median swelling. There is an external lamella on the anterior margin of both valves.

The external surface is smooth.

MEASUREMENTS.–The size range of the specimens in sample RF4:122 is shown in Fig. 40.

REMARKS.–There is a distinct variation in the present material. Specimens agreeing with the description of *"O." mouhersensis* occur together with specimens which are extremely like *Ogmoconchella adenticulata* (PIETRZENUK, 1961). The number of *O. adenticulata*-like forms increases upwards in the section.

The true *"O." mouhersensis* is characterized by a

posteromedian swelling giving one sixth of the carapace from the posterior end a triangular outline in dorsal view. *O. adenticulata* on the other hand has its greatest width just behind the mid-point. This gives the carapace an oviform outline in dorsal view. *O. adenticulata* also has a more rounded anterior margin than *"O." mouhersensis.*

Michelsen (1975, p. 118) suggested that *"O." mouhersensis* and *O. adenticulata* belong to the same evolutionary line. He also found intermediate forms between the two species. Intermediate forms also occur in the Swedish material studied.

Michelsen's specimens from the Lower Pliensbachian are relatively longer than those from the Upper Sinemurian. A similar variation occurs in the present material but cannot be correlated with the time factor.

The influx of forms resembling *O. adenticulata* increases upwards in the Lower Pliensbachian, while forms agreeing with *"O." mouhersensis* dominate in the Upper Sinemurian. These facts support the assumption that *"O." mouhersensis* belongs to the same morphological line as *O. adenticulata,* and that *"O." mouhersensis* gradually changes into *O. adenticulata.*

As no clearly defined *O. adenticulata* have been found in the present material, and the fact that the specimens were more like *"O." mouhersensis* than *O. adenticulata,* all the specimens investigated were referred to *"O." mouhersensis.*

DISTRIBUTION.–Upper Sinemurian and Lower Pliensbachian in Skåne and Denmark (Sivhed in the present paper, Michelsen 1975, p. 249). Sinemurian and Lower Pliensbachian in France (Apostolescu 1959, p. 805).

Ogmoconchella? *scanica* SIVHED, 1977
Pl. XII, Figs. 114–115

1977 *Ogmoconchella*? *scanica* SIVHED.–Pp. 19–20, Pl. 3, Figs. 27–30, Text-Fig. 7.

MATERIAL.–48 complete carapaces in samples 366:5, 7; 620:54; Ga:19, 24, 25, 28, 29.

DIAGNOSIS and DESCRIPTION.–See Sivhed 1977, p. 19.

REMARKS.–*O. scanica* resembles *O. danica,* but differs in having a weak concavity just behind the mid-point. *O. scanica* also shows affinities to specimens of *O. aequalis,* recorded from the Öresund No. 3 drill-core, (Michelsen 1975, pp. 237–238, Pl. 30, Figs. 443–444). Most of the specimens referred to *O. aequalis* in this drill-core display a weak concavity, similar to that of *O. scanica,* but *O. aequalis* differs from *O. scanica* in having a more symmetrical carapace outline in lateral view.

DISTRIBUTION.–Upper Sinemurian and lower Lower Pliensbachian in Skåne.

Order MYODOCOPIDA SARS, 1866
Suborder CLADOCOPINA SARS, 1866
Family POLYCOPIDAE SARS, 1866
Genus *Polycope* SARS, 1866

Polycope cerasia BLAKE, 1876
Pl. XII, Fig. 120

1876 *Polycope cerasia* BLAKE.–P. 434, Pl. 17, Fig. 16.
1938 *Ostracode* (151) WICHER.–Pl. 27, Fig. 9.
1952 *Polycope* sp. (10) USBECK.–P. 406, Pl. 18, Fig. 66.
1954 *Polycope cerasia* TATE & BLAKE.–Bach, p. 80, Pl. 8, Figs. 2a–b.
1954 *Polycope cerasia* TATE & BLAKE.–Neuweiler, p. 89, Pl. 7, Figs. 1, 2.
1958 *Polycope cerasia* TATE & BLAKE.–Drexler, p. 501, Pl. 21, Fig. 1.
1959 *Polycope pumicosa* APOSTOLESCU.–P. 811, Pl. 1, Fig. 1.
1961b *Polycope cerasia* TATE & BLAKE.–Fischer, p. 500, Fig. 1.
1961 *Polycope pumicosa* APOSTOLESCU.–Cousin & Apostolescu, p. 428, Fig. 1.
1961 *Polycope pumicosa* APOSTOLESCU.–Apostolescu, p. 448, Fig. 5.
1967 *Polycope* aff. *pumicosa* APOSTOLESCU.–Donze, p. 73, Pl. 1, Figs. 2–5.
1968 *Polycope* (Ostracode (151) Wicher).–Christensen, Pl. 23, Fig. 31.
1971 *Polycope cerasia* BLAKE.–Lord, p. 645, Pl. 122, Figs. 1–2.
1975 *Polycope cerasia* BLAKE.–Michelsen, pp. 258–259, Pl. 39, Figs. 550–554.
1977 *Polycope cerasia* BLAKE.–Sivhed, p. 21, Pl. 3, Fig. 34.
1978 *Polycope cerasia* BLAKE.–Lord, p. 204, Pl. 4, Figs. 11, 12, Table 2.

MATERIAL.–15 complete carapaces and 1 right valve in samples 334:73; 359:6; 367:29; Ga:46, 54; Ka:788, 800, 925; Kä:41; RF4:123; T:66.

DIAGNOSIS.–See Blake 1876, p. 43.

DESCRIPTION.–See Lord 1971, p. 645.

REMARKS.–Most of the specimens studied are more or less deformed. The internal features cannot be seen. The sculpture of the recorded specimens is a network of fine ribs forming a sharply angular pattern. Michelsen's specimens (1975, Figs. 550–552) as well as those described by others display a sculpture consisting of a more uniform network than that of the present ones. This fact might be due to the variation within the species. A fact worth noting is that the more corroded the specimens are, the broader are the ribs of the sculpture.

DISTRIBUTION.–Lower Sinemurian to Lower Pliensbachian in Skåne, Lower Sinemurian to Upper Pliensbachian in Denmark (Michelsen 1975, p. 259). Hettangian to Toarcian in Germany (Fischer 1961, p. 500), Upper Lotharingian to Pliensbachian in France (Viaud 1963). Recorded also from Upper Carixian to the Lower Domerian in France (Donze 1967, p. 73) and from upper part of Hettangian to lower part of Pliensbachian in England (Lord 1978, Table 2).

Polycope minor MICHELSEN, 1975
Pl. XII, Fig. 118

1968 *Polycope* sp. 851 CHRISTENSEN.–Pl. 23, Fig. 6.
1970 *Polycope* No. 4065 MICHELSEN.–P. 49, Pl. 12, Figs. 6a–b.
1975 *Polycope minor* MICHELSEN.–Pp. 261–262, Pl. 38, Figs. 546–547; Pl. 39, Figs. 555–562.

MATERIAL.–2 complete carapaces in samples 334:70; 336:14.

DIAGNOSIS and DESCRIPTION.–See Michelsen 1970, p. 49.

MEASUREMENTS.–The two specimens found have been measured. They are 0.17 mm long, 0.18 mm high and 0.12 mm long, 0.13 mm high respectively. These measurements agree quite well with those made by Michelsen (1970, p. 50).

DISTRIBUTION.–Lower Sinemurian and Lower Pliensbachian in Skåne, Hettangian to lower Upper Sinemurian in Denmark (Michelsen 1975, p. 262).

Polycope plumhoffi BATE & COLEMAN, 1975
Pl. XII, Fig. 117

1963 *Polycope* cf. *maculata* MÜLLER.–Plumhoff, p. 18, Pl. 1, Fig. 3.
1975 *Polycope plumhoffi* BATE & COLEMAN.–P. 4, Fig. 2, Pl. 1, Figs. 1, 4.

MATERIAL.–2 complete carapaces in samples 620:15 and Ka:778.

DIAGNOSIS and DESCRIPTION.–See Bate & Coleman 1975, p. 4.

MEASUREMENTS.–The specimen in sample 620:15 is 0.29 mm high and 0.25 mm long. The specimen in sample Ka:778 is 0.31 mm high. Its length could not be measured.

REMARKS.–The specimens studied are smaller than those described by Plumhoff (1963, p. 18) and Bate & Coleman (1975, p. 4). The Swedish specimens were found in older beds (Lower Pliensbachian) than the specimens described from Germany and England.

DISTRIBUTION.–Lower Pliensbachian in Skåne, Upper Aalenian to Lower Bajocian in northwestern Germany (Plumhoff 1963, p. 18), Lower Toarcian in England (Bate & Coleman 1975, p. 4).

Polycope n.sp.
Pl. XII, Fig. 119

MATERIAL.–1 complete carapace in sample Ka:780.

HOLOTYPE.–SGU Type 500.

DESCRIPTION.–The carapace is subtriangular in lateral view with slight cardinal angles on the dorsal margin. The dorsal margin is straight.

The reticulation is both primary and secondary. The primary reticulation consists of three parallel ridges anteriorly and a network posteriorly. The secondary reticulation is a plain network.

MEASUREMENTS.–Length 0.19 mm, height 0.19 mm.

REMARKS.–No inner structures have been observed. Unfortunately only one specimen has been found.

DISTRIBUTION.–Lower Pliensbachian in Skåne.

Summary

About 470 samples from the Lower Jurassic of Skåne have been studied as to the occurrence of ostracodes. Around 170 of the samples have yielded ostracodes. No statistical calculations on the abundance of the ostracodes have been made. Many of the ostracodes are fragmentary or poorly preserved. It is therefore impossible to calculate the numbers of specimens destroyed during the diagenesis and during laboratory treatment.

The ostracode fauna from Skåne treated in this paper and the ostracode fauna from the Danish Embayment, described by Michelsen (1975), show close affinities. The ostracode fauna in this paper has yielded forty-one species, seven of which are described as new. The two identified ostracode zones are among those described by Michelsen (1975) from the Danish Embayment. They are the *Cristacythere betzi–C. crassireticulata* and the *Ogmoconchella danica* Zones. The subzones of the *O. danica* Zone are also indicated.

The fact that many species occur both in Skåne and in the Danish Embayment is not surprising, as the northwestern and western parts of Skåne formed marginal areas of the marine basin which extended over most of Denmark. This is also the reason why many of the species recorded are identical with those described by Michelsen (1975). The presence of species not described previously could be due to the fact that the sections investigated are at the margin of the Danish Embayment which might have offered local conditions. Generally speaking the ostracode fauna obtained also shows similarities to contemporary ones of Germany, France and England.

As far as possible, the ostracode zonation has been correlated with the established ammonite zonation of northwest Skåne. When correlating the *Progonoidea reticulata* Subzone with the ammonite zonation a small difference has been noted between Skåne on the one hand and Denmark and Germany on the other (cf. p. 12).

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SGU = Sveriges geologiska undersökning
DGU = Danmarks geologiske undersøgelse

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PLATE I

Figs. 1, 3–4. *Bairdia gantoftensis* n.sp.

1: Carapace, left side, holotype. Sample No. 360:26. SEM X 110. SGU Type 399.

3: Right valve, internal view. Sample No. 334:19. SEM X 105. The specimen got lost during treatment.

4: Carapace, dorsal view, topotype. Sample No. 360:26. SEM X 155. SGU Type 400.

Figs. 2, 9. *Bairdia molesta* APOSTOLESCU, 1959, morphological group 2.

2: Carapace, left side. Sample No. Ka: 788. SEM X 90. SGU Type 401.

9: Carapace, dorsal view. Sample No. Ka:788. SEM X 100. SGU Type 402.

Figs. 5–6. *Bairdia molesta* APOSTOLESCU, 1959, morpfological group 1.

5: Carapace, dorsal view. Sample No. 360:27. SEM X 130. SGU Type 403.

6: Carapace, left side. Sample No. 360:27. SEM X 90. SGU Type 403.

Figs. 7–8. *Bairdia* cf. sp. 4185 MICHELSEN, 1975.

7: Carapace, right side. Sample No. Ka:940. SEM X 80. SGU Type 404.

8: Carapace, dorsal view. Sample No. Ka: 940. SEM X 90. SGU Type 404.

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PLATE II

Figs. 10–12. *Isobythocypris* aff. *elongata* (BLAKE, 1876).

10: Carapace, left side. Sample No. 359:6. SEM X 105. SGU Type 405.

11: Carapace, dorsal view. Sample No. 359:6. SEM X 110. SGU Type 406.

12: Carapace, right side. Sample No. 359:6. SEM X 90. SGU Type 407.

Figs. 13–15. *Isobythocypris elongata* (BLAKE, 1876)?

13: Right side, external view. Sample No. 359:6. SEM X 90. SGU Type 408.

14: Carapace, right side. Sample No. 360:26. SEM X 110. SGU Type 409.

15: Left side, internal view. Sample No. 360:26. SEM X 80. SGU Type 410.

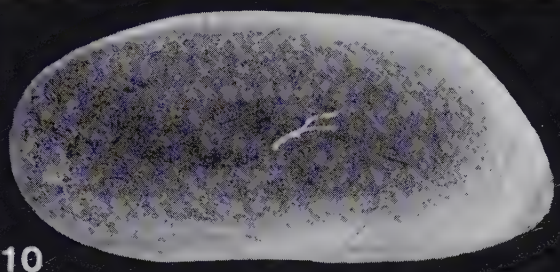
Figs. 16–19. *Isobythocypris* cf. *elongata* (BLAKE, 1876).

16: Carapace, right side. Sample No. 360:13. SEM X 85. SGU Type 411.

17: Carapace, right side. Sample No. 360:11. SEM X 90. SGU Type 412.

18: Carapace, left side. Sample No. 360:11. SEM X 95. SGU Type 413.

19: Left side, internal view. Sample No. 359:4. SEM X 90. SGU Type 414.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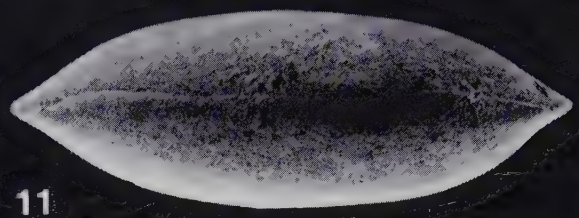
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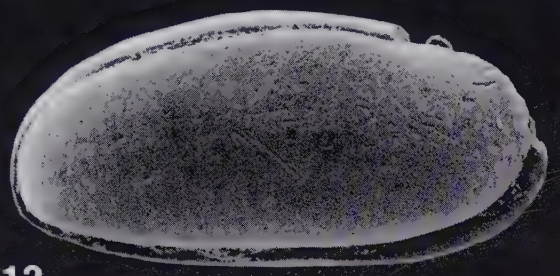
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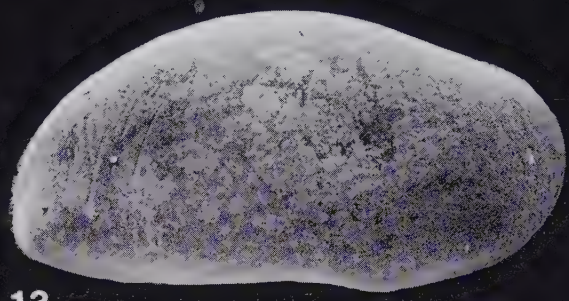
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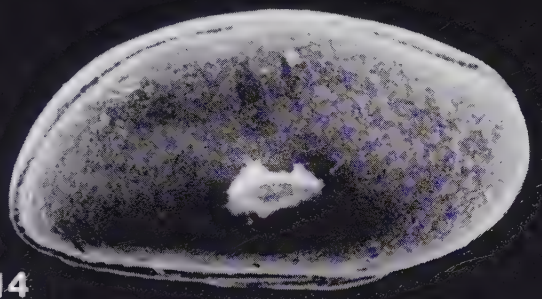
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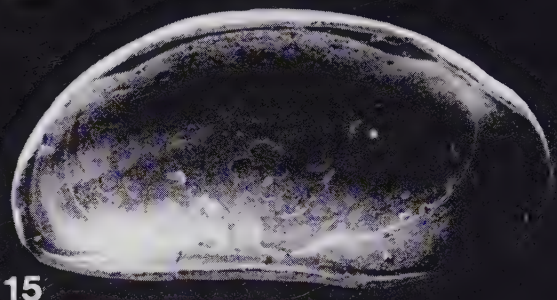
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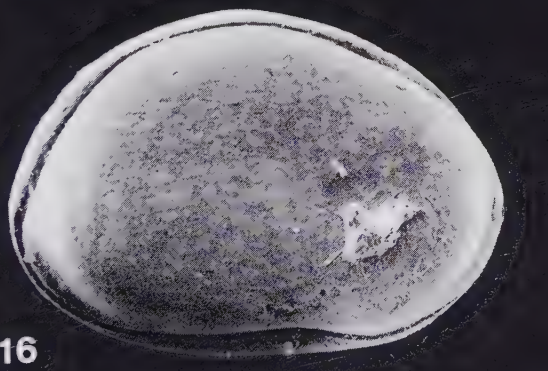
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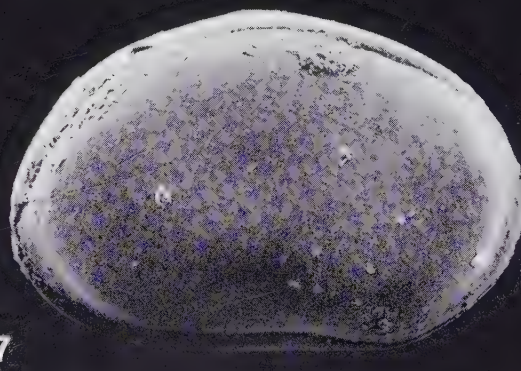
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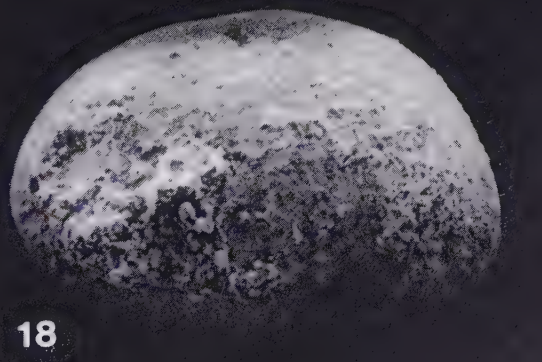
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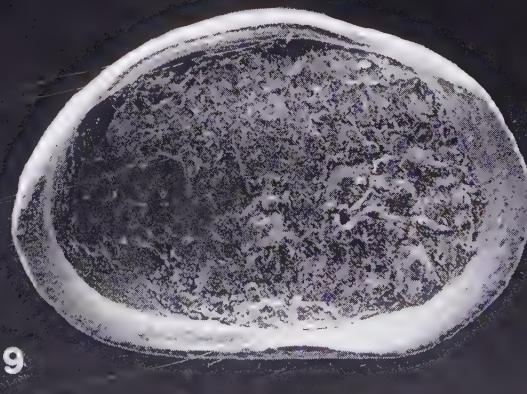
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PLATE III

Figs. 20, 22, 25. *Pseudomacrocypris subtriangularis* MICHELSEN, 1975.
20: Carapace, left side. Sample No. 841:2. SEM X 165. SGU Type 415.
22: Carapace, right side. Sample No. 841:4. SEM X 185. SGU Type 416.
25: Carapace, right side. Sample No. T:66. SEM X 165. SGU Type 417.

Figs. 21, 24. *Paracypris*? *longiformis* n.sp.
21: Carapace, dorsal view, holotype. Sample No. 334:8. SEM X 125. SGU Type 418.
24: Carapace, right side, holotype. Sample No. 334:8. SEM X 115. SGU Type 418.

Figs. 23, 26, 28, 30. *Paracypris*? *redcarensis* (BLAKE, 1876).
23: Carapace, dorsal view. Sample No. Ga:7. SEM X 190. SGU Type 419.
26: Carapace, left side. Sample No. 360:22. SEM X 110. SGU Type 420.
28: Carapace, right side. Sample No. 359:16. SEM X 155. SGU Type 421.
30: Carapace, right side. Sample No. Ga:7. SEM X 180. SGU Type 419.

Fig. 27. *Cytheropteron*? *cavatum* MICHELSEN, 1975.
Right side, external view. Sample RF4:125. SEM X 175. SGU Type 422.

Fig. 29. *Liasina* cf. *vestibulifera*. GRAMANN, 1963.
Carapace, left side. Sample No. 334:67. SEM X 155. SGU Type 423.

Fig. 31. *Procytherura*? n. sp.
Carapace, dorsal view, holotype. Sample No. Ka: 955. SEM X 210. SGU Type 424.

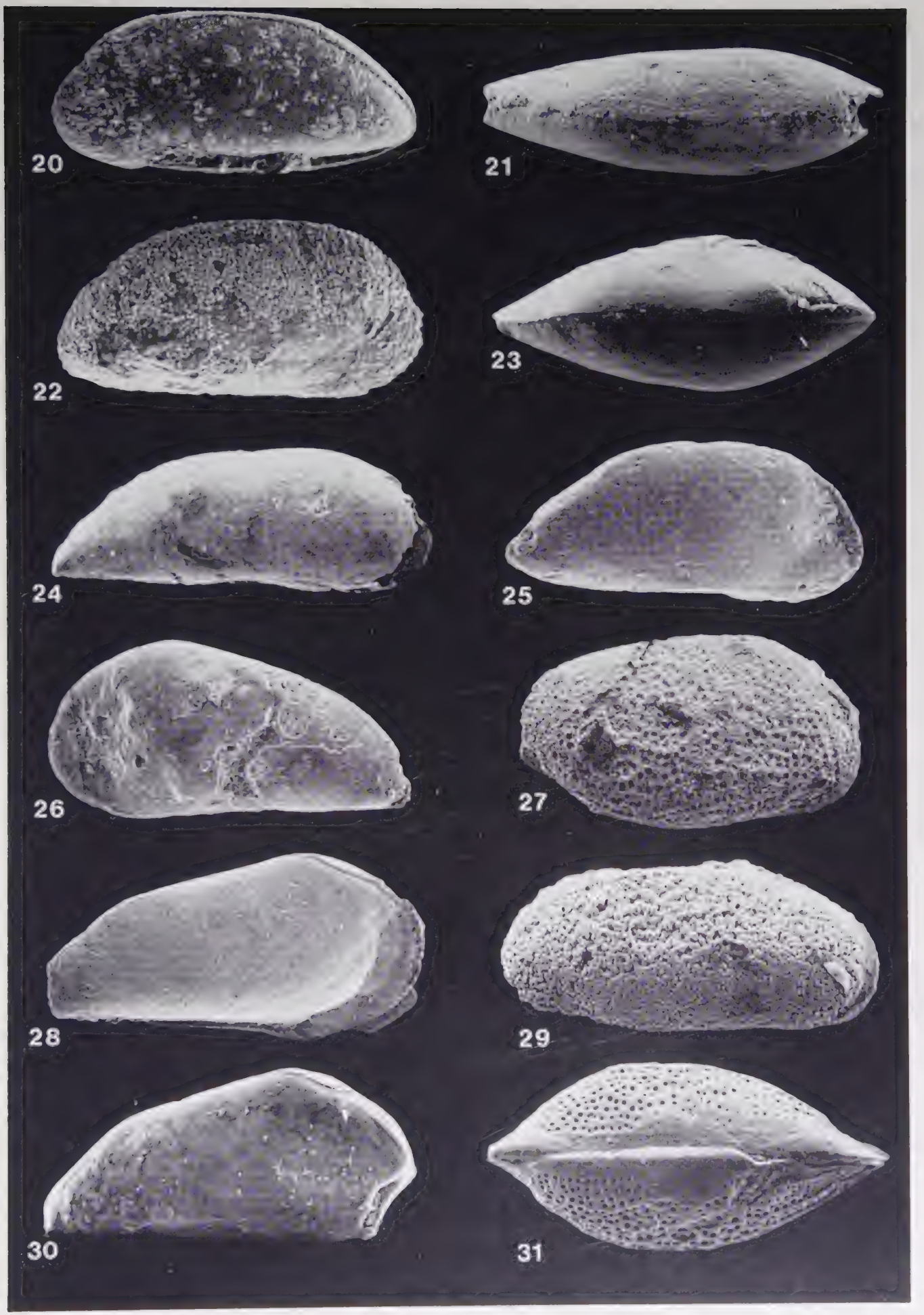
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PLATE IV

Figs. 32, 38. *Procytherura*? n. sp.
32: Carapace, right side, holotype. Sample No. Ka: 955. SEM X 200. SGU Type 424.
38: Carapace, ventral view, holotype. Sample No. Ka: 955. SEM X 220. SGU Type 424.

Figs. 33, 35. *Acrocythere* cf. *gassumensis* MICHELSEN, 1975.
33: Carapace, dorsal view. Sample No. Ga:13. SEM X 215. SGU Type 425.
35: Carapace, right side. Sample No. 620:158. SEM X 200. SGU Type 426.

Figs. 34, 36, 39. *Acrocythere oeresundensis* MICHELSEN, 1975.
34: Carapace, dorsal view. Sample No. 620:28. SEM X 205. SGU Type 427.
36: Carapace, right side. Sample No. Ka:756. SEM X 220. SGU Type 428.
39: Carapace, right side. Sample No. 620:28. SEM X 195. SGU Type 427.

Figs. 37, 40. *Cristacythere betzi* (KLINGLER & NEUWEILER, 1959).
37: Carapace, dorsal view. Sample No. T:66. SEM X 130. SGU Type 429.
40: Carapace, left side. Sample No. T:66. SEM X 120. SGU Type 430.

Fig. 41. *Acrocythere rectangula* MICHELSEN, 1975.
Carapace, left side. Sample No. Ör: 14. SEM X 180. SGU Type 431.

Fig. 42. *Acrocythere tricostata* MICHELSEN, 1975.
Carapace, left side. Sample No. RF4:125. SEM X 140. SGU Type 432.

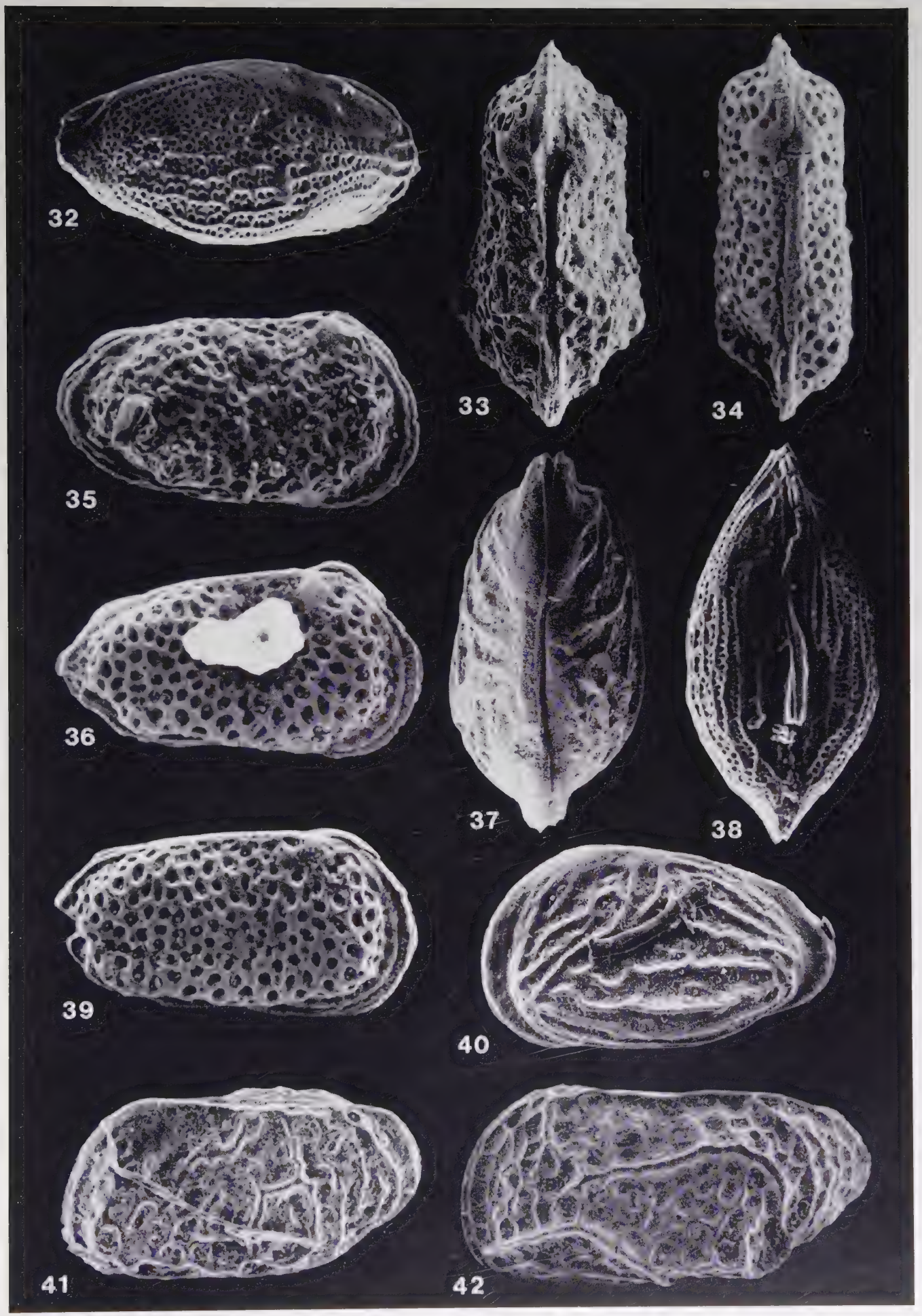
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PLATE V

Figs. 43–44, 46, 49. *Cristacythere crassireticulata* MICHELSEN, 1975.

43: Carapace, right side. Sample No. 841:2. SEM X 250. SGU Type 433.

44: Carapace, right side. Sample No. 841:2. SEM X 180. SGU Type 434.

46: Left side, external view. Sample No. 841:2. SEM X 175. SGU Type 435.

49: Carapace, dorsal view. Sample No. 359:10. SEM X 210. SGU Type 436.

Figs. 45, 47–48. *Gramannella apostolescui* (GRAMANN, 1962).

45: Right side, external view. Sample No. Ka: 830. SEM X 200. SGU Type 437.

47: Right side, internal view. Sample No. Ka: 830. SEM X 205. SGU Type 438.

48: Carapace, dorsal view. Sample No. Ka: 955. SEM X 190. SGU Type 439.

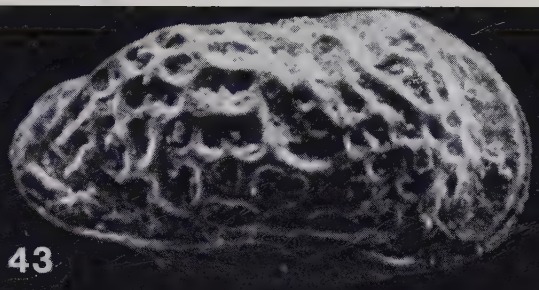
Figs. 50–52. *Gramannella laevigata* MICHELSEN, 1975.

50: Right side, internal view. Sample No. 336:12. SEM X 110. SGU Type 440.

51: Right side, external view. Sample No. 336:15. SEM X 115. SGU Type 441.

52: Right side, external view. Detail with a pore canal. Sample No. 336:15. SEM X 1450. SGU Type 441.

Fig. 53. *Cristacythere betzi* (KLINGLER & NEUWEILER, 1959). Carapace, right side. Sample No. T:66. SEM X 130. SGU Type 442.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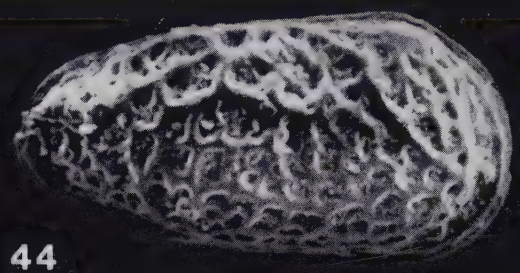
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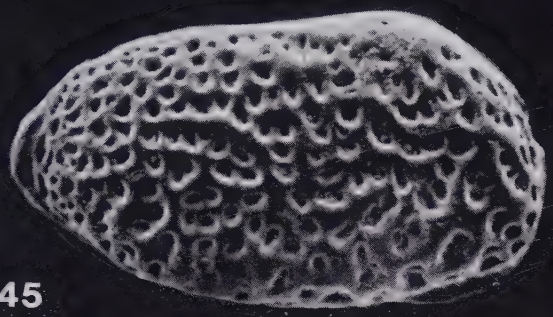
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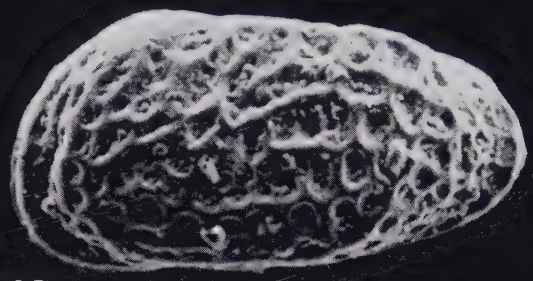
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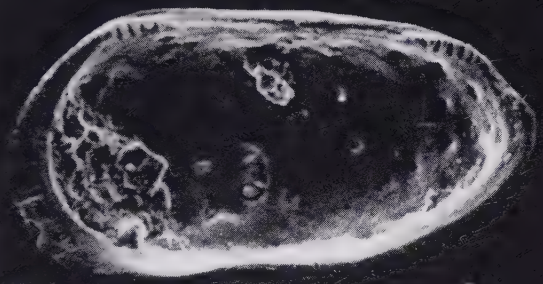
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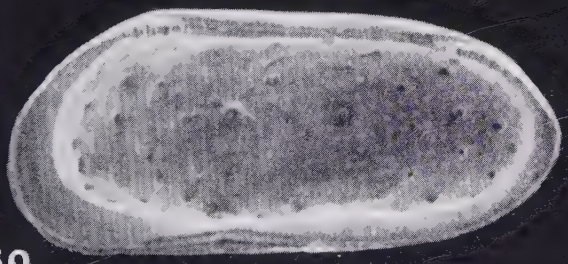
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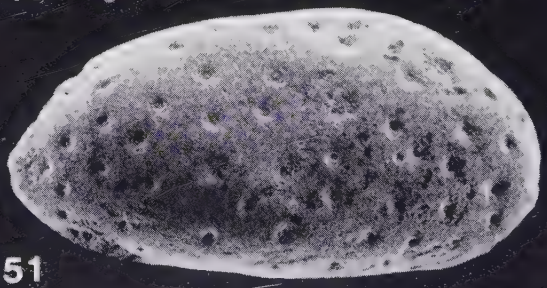
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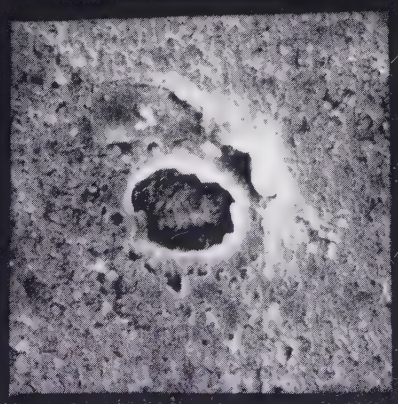
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PLATE VI

Figs. 54, 56, 58. *Kinkelinella (Klinglerella) foveolata* MICHELSEN, 1975.

54: Left valve, external view. Sample No. RF1:71. SEM X 105. SGU Type 443.

56: Left valve, external view. Sample No. RF1:71. SEM X 95. SGU Type 444.

58: Right valve, external view. Sample No. RF1:71. SEM X 105. SGU Type 445.

Figs. 55, 57. *Kinkelinella (Klinglerella)* cf. *laqueata* (KLINGLER & NEUWEILER, 1959).

55: Left valve, external view. Sample No. 840:6. SEM X 105. SGU Type 446.

57: Right valve, external view. Sample No. 840:6. SEM X 135. SGU Type 447.

Figs. 59–63. *Kinkelinella (Klinglerella) katsloesensis* n.sp.

59: Right valve, internal view. Sample No. 841:8. SEM X 235. SGU Type 448.

60: Right valve, external view, holotype. Sample No. 841:8. SEM X 165. SGU Type 449.

61: Left valve, external view. Sample No. 841:8. SEM X 170. SGU Type 450.

62: Right valve, external view. Sample No. 841:8. SEM X 215. SGU Type 451.

63: Right valve, external view. Sample No. 841:8. SEM X 215. SGU Type 452.

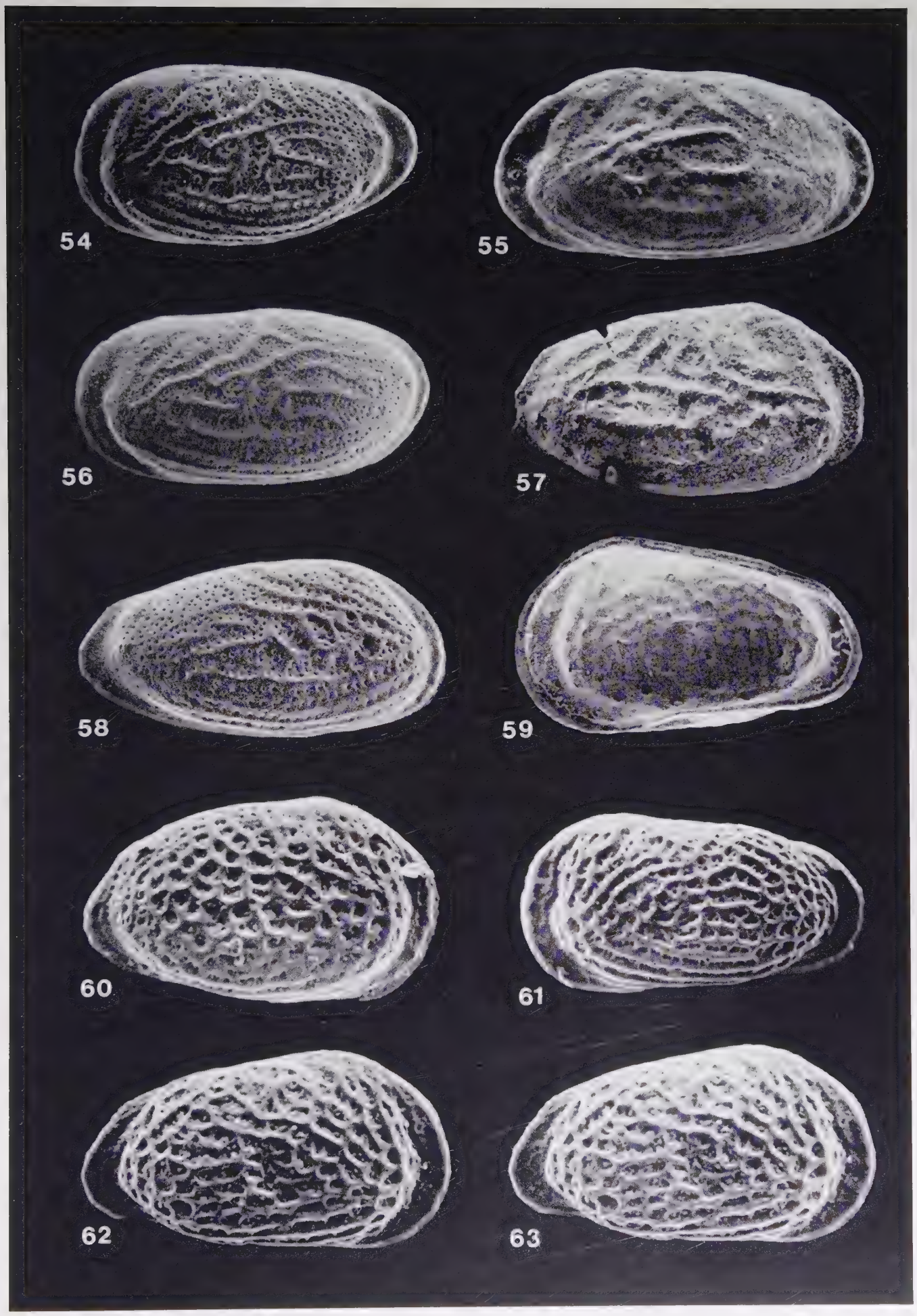
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PLATE VII

Figs. 64–65, 73. *Kinkelinella (Klinglerella) variabilis* (KLINGLER & NEUWEILER, 1959).
64: Right side, internal view. Sample No. RF4:125. SEM X 160. SGU Type 453.
65: Right side, external view. Sample No. RF4:125. SEM X 160. SGU Type 454.
73: Right side, internal view. Detail with the anterior part of the hinge. Sample No. RF4:125. SEM X 470. SGU Type 453.

Fig. 66. *Nanacythere (Goniocythere) ventricosta* n. sp.
Carapace, dorsal view. Sample No. 358:42. SEM X 220. SGU Type 456.

Fig. 67. *Kinkelinella (Klinglerella) foveolata* MICHELSEN, 1975.
Carapace, dorsal view. Sample No. RF4:119. SEM X 100. SGU Type 457.

Fig. 68. *Kinkelinella (Klinglerella) triebeli* (KLINGLER & NEUWEILER, 1959).
Left side, external view. Sample No. Ga:29. SEM X 120. SGU Type 455.

Figs. 69–70. *Nanacythere (Goniocythere) bachi* (GRAMANN, 1962).
69: Left side, external view. Sample No. RF4:119. SEM X 190. SGU Type 458.
70: Carapace, left side. Sample No. Ka:790. SEM X 205. SGU Type 459.

Figs. 71–72. *Nanacythere (Goniocythere) minor* MICHELSEN, 1975.
71: Right side, external view. Sample No. RF1:75. SEM X 270. SGU Type 460.
72: Left side, external view. Sample No. RF1:82. SEM X 245. SGU Type 461.

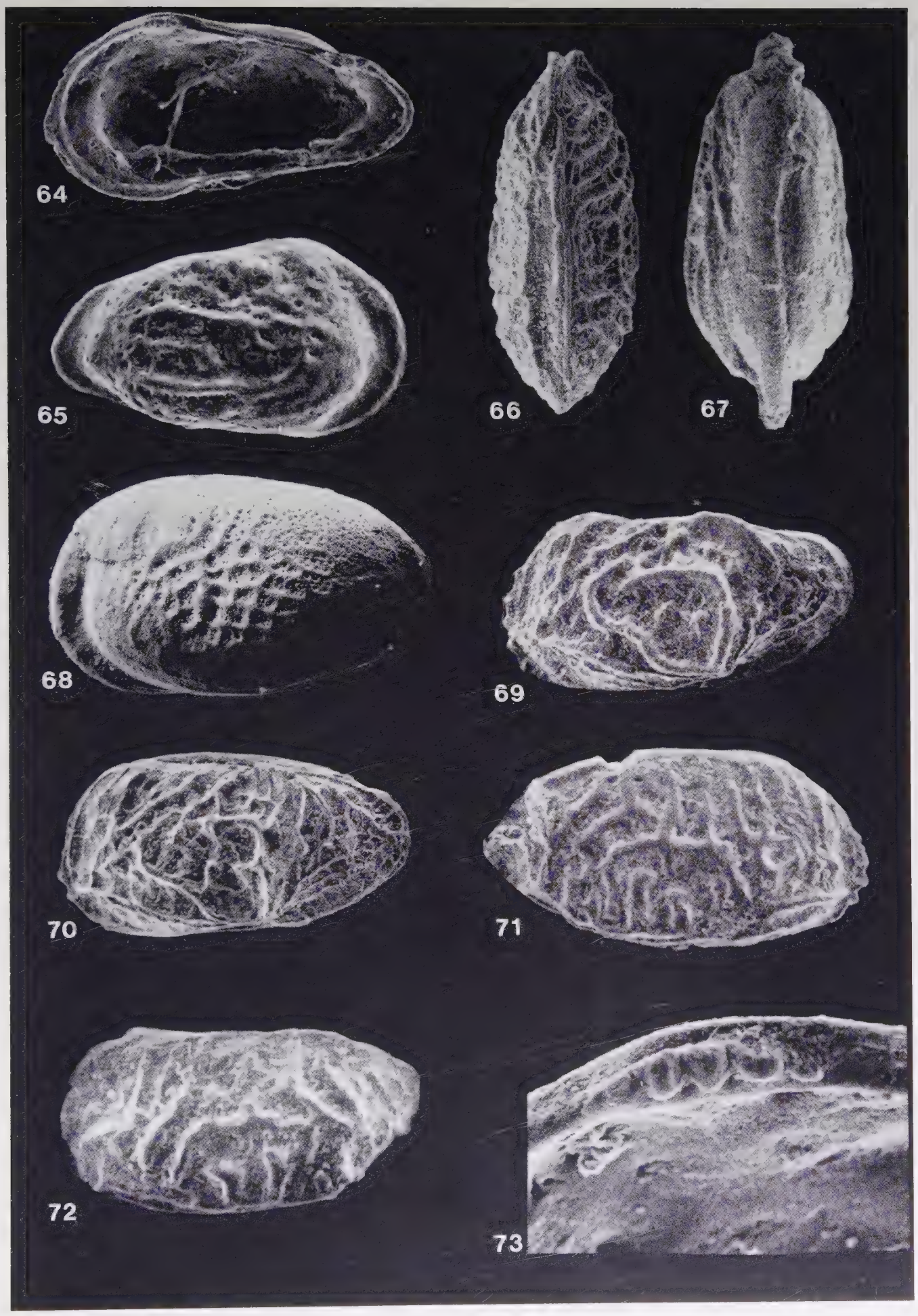
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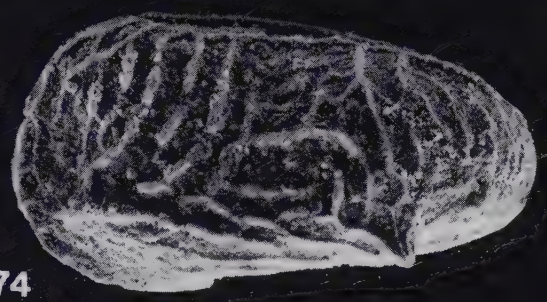
PLATE VIII

Figs. 74–75. *Nanacythere (Goniocythere) ventricosta* n. sp.
74: Carapace, left side, holotype. Sample No. 358:42. SEM X 205. SGU Type 462.
75: Carapace, right side. Sample No. 358:42. SEM X 220. SGU Type 463.

Figs. 76, 82. *Progonoidea polygonata* n. sp.
76: Carapace, dorsal view, holotype. Sample No. 334:67. SEM X 135. SGU Type 464.
82: Carapace, right side, holotype. Sample No. 334:67. SEM X 135. SGU Type 464.

Figs. 77–81. *Pleurifera harpa* (KLINGLER & NEUWEILER, 1959).
77: Carapace, dorsal view. Sample No. Ka:830. SEM X 145. SGU Type 465.
78: Carapace, right side. Sample No. Ka:776. SEM X 135. SGU Type 466.
79: Right side, external view. Sample No. RF4:104. SEM X 140. SGU Type 467.
80: Left side, light microscope picture. Sample No. 620:9. SEM X 120. SGU Type 468.
81: Left side, external view. Sample No. RF4:122. SEM X 125. SGU Type 469.

Fig. 83. *Progonoidea reticulata* (KLINGLER & NEUWEILER, 1959).
83: Right side, external view. Sample No. Ör:21. SEM X 95. SGU Type 470.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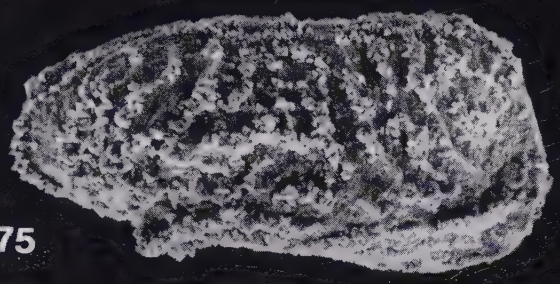
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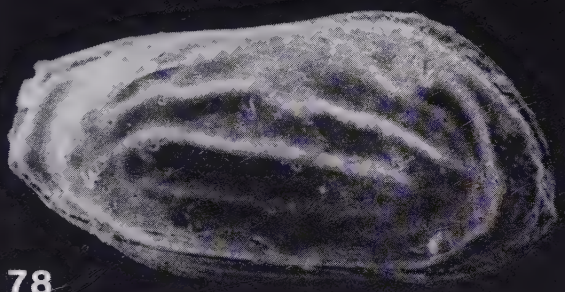
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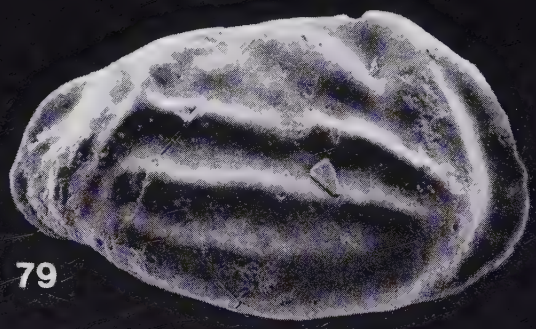
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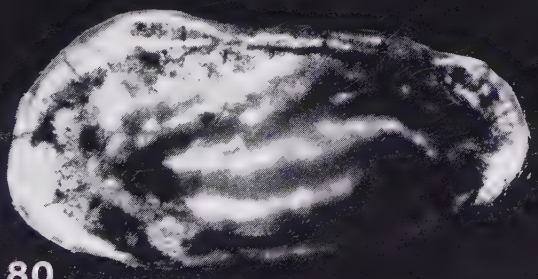
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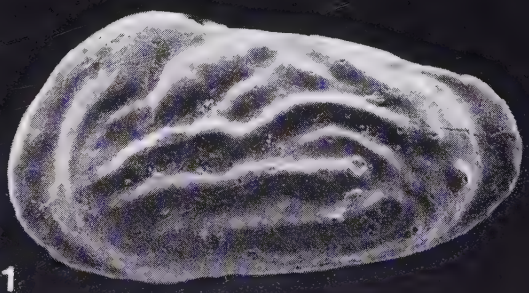
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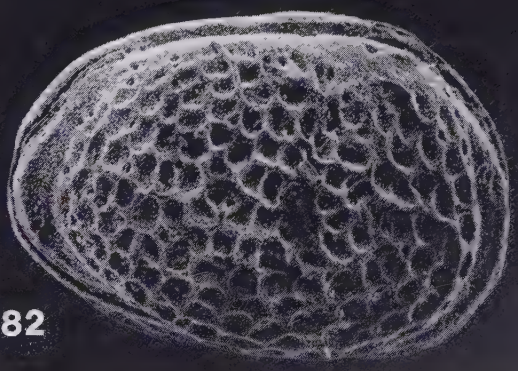
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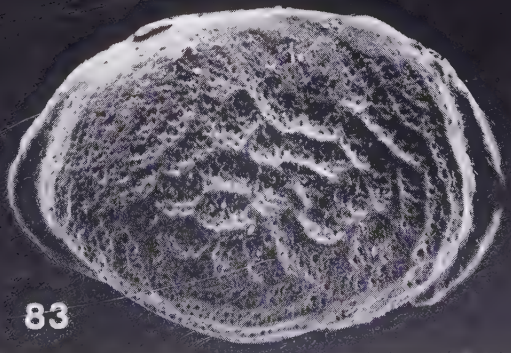
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PLATE IX

Figs. 84–85. *Progonoidea reticulata* (KLINGLER & NEUWEILER, 1959).
84: Right side, external view. Sample No. Ör:21. SEM X 105. SGU Type 471.
85: Left side, external view. Sample No. 840:6. SEM X 95. SGU Type 472.

Figs. 86, 89, 91. *Ogmoconcha amalthei amalthei* (QUENSTEDT, 1858).
86: Carapace, dorsal view. Sample No. Kä:63. SEM X 90. SGU Type 473.
89: Carapace, left side. Sample No. Kä:63. SEM X 80. SGU Type 473.
91: Right side, external view. Sample No. Kä:68. SEM X 90. SGU Type 474.

Fig. 87. *Ogmoconchella bispinosa* (GRÜNDEL, 1964).
Carapace, dorsal view. Sample No. 620:21. SEM X 140. SGU Type 475.

Figs. 88, 90, 92–93. *Ogmoconchella aequalis* HERRIG, 1969.
88: Right side, external view. Sample No. RF4:123. SEM X 100. SGU Type 476.
90: Carapace, left side. Sample No. Kä:30. SEM X 260. SGU Type 477.
92: Carapace, right side. Sample No. Kä:30. SEM X 200. SGU Type 478.
93: Right side, external view. Sample No. Kä:30. SEM X 200. SGU Type 479.

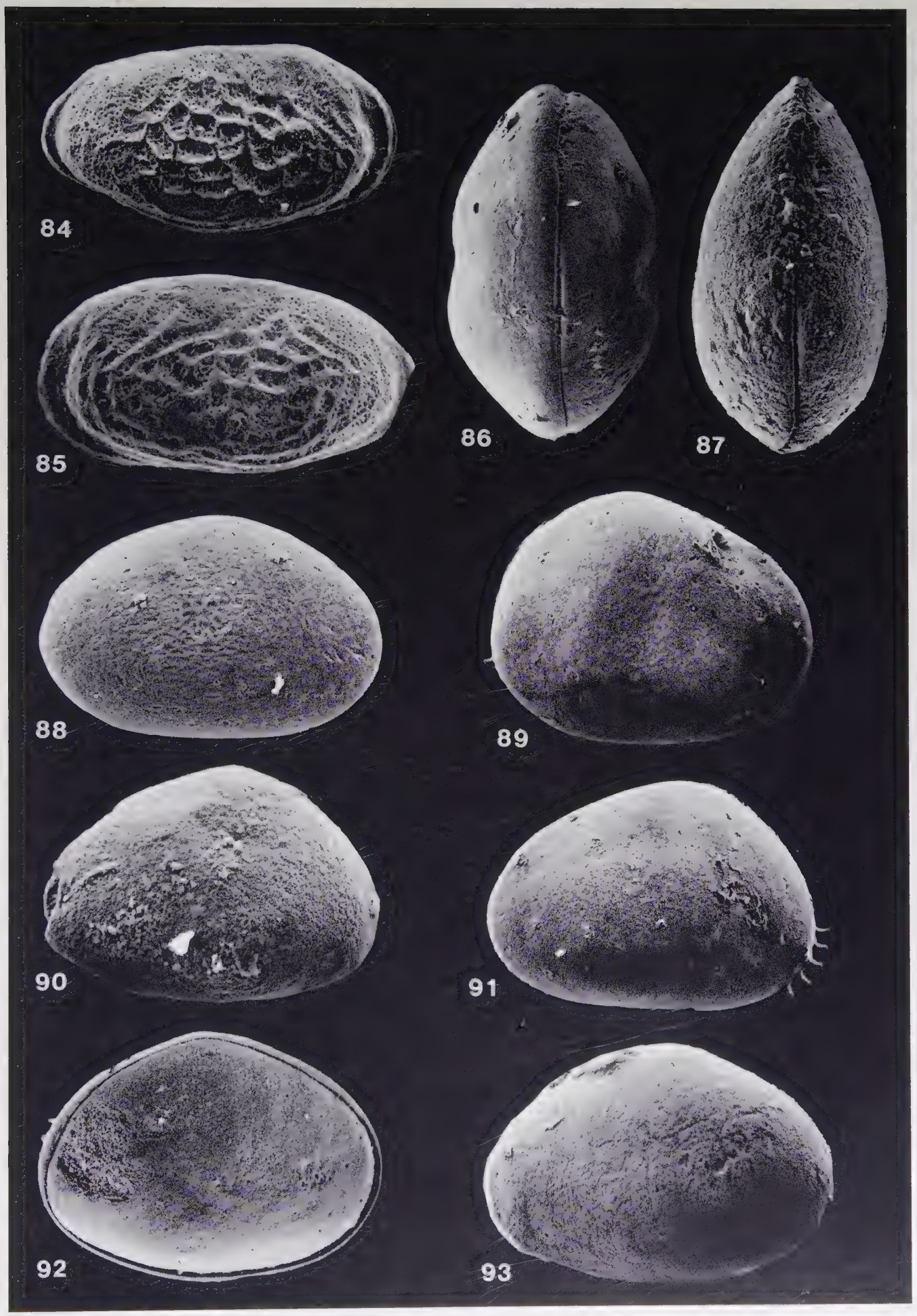
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PLATE X

Figs. 94, 97. *Ogmoconchella bispinosa* (GRÜNDEL, 1964).

94: Right side, external view. Sample No. Kä:83. SEM X 220. SGU Type 480.

97: Carapace, right side, external view. Sample No. 620:35. SEM X 280. SGU Type 481.

Figs. 95–96, 98–102. *Ogmoconchella danica* MICHELSEN, 1975.

95: Carapace, dorsal view. Sample No. 359:6. SEM X 145. SGU Type 482.

96: Carapace, dorsal view. Sample No. 359:6. SEM X 180. SGU Type 483.

98: Carapace, right side. Sample No. 359:6. SEM X 135. SGU Type 484.

99: Carapace, right side. Sample No. 359:5. SEM X 105. SGU Type 485.

100: Left side, external view. Sample No. 359:6. SEM X 115. SGU Type 486.

101: Carapace, left side. Sample No. 334:58. SEM X 100. SGU Type 487.

102: Carapace, left side. Sample No. 334:58. SEM X 115. SGU Type 488.

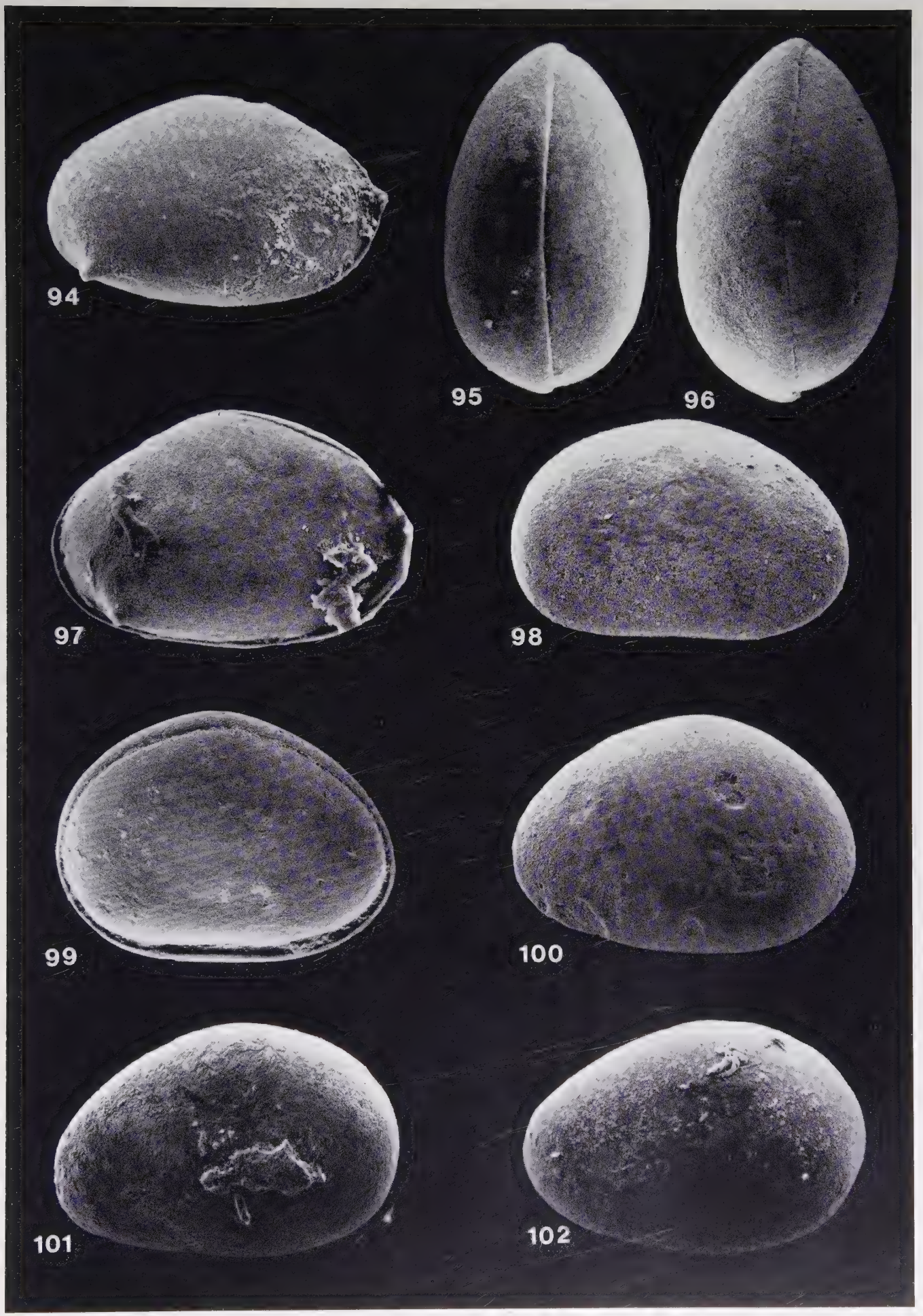
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PLATE XI

Figs. 103–108. *"Ogmoconchella" mouhersensis* (APOSTOLESCU, 1959).

103: Left side, external view. Sample No. RF1:71. SEM X 120. SGU Type 489.

104: Carapace, right side. Sample No. RF1:71. SEM X 120. SGU Type 490.

105: Carapace, dorsal view. Sample No. 334:36. SEM X 125. SGU Type 491.

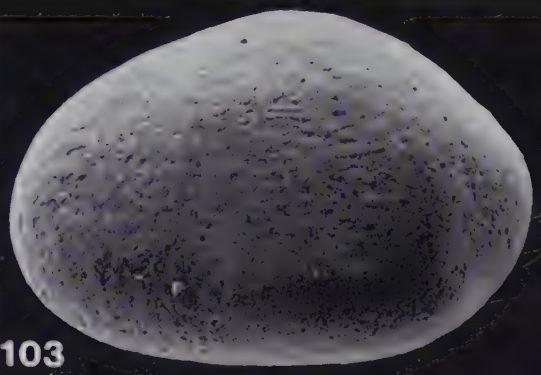
106: Carapace, dorsal view. Sample No. RF4:119. SEM X 130. SGU Type 492.

107: Carapace, right side. Sample No. 620:29. SEM X 105. SGU Type 493.

108: Carapace, right side. Detail of the external surface. Sample No. RF1:71. SEM X 1150. SGU Type 490.

Fig. 109. *Ogmoconchella aequalis* HERRIG, 1969.
Right side, detail with the muscle scars. Sample No. RF4:123. SEM X 490. SGU Type 494.

Fig. 110. *Ogmoconchella danica* MICHELSEN, 1975.
Detail of the external surface. Sample No. 359:5. SEM X 1050. SGU Type 485.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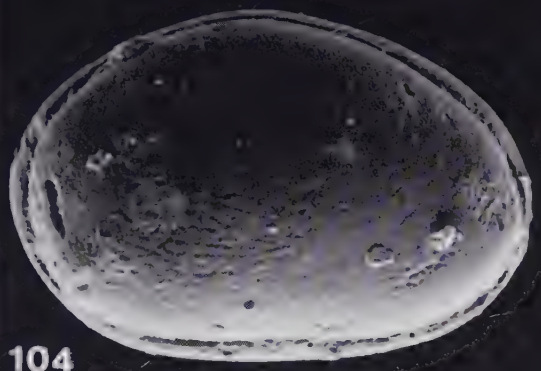
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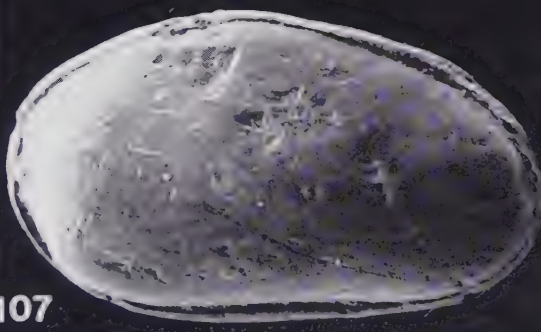
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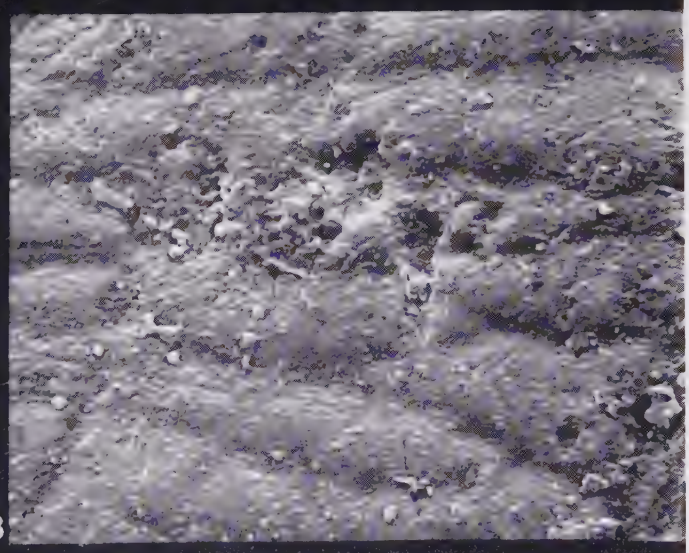
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PLATE XII

Figs. 111–113. *"Ogmoconchella" mouhersensis* (APOSTOLESCU, 1959).
111: Carapace, left side. Sample No. 334:36. SEM X 115. SGU Type 495.
112: Left side, external view. Sample No. 620:8. SEM X 105. SGU Type 496.
113: Carapace, right side. Sample No. 620:4. SEM X 110. SGU Type 497.

Figs. 114–115. *Ogmoconchella? scanica* SIVHED, 1977.
114: Carapace, left side. Sample No. 620:54. SEM X 150. SGU Type 498.
115: Carapace, right side. Sample No. 620:54. SEM X 120. SGU Type 499.

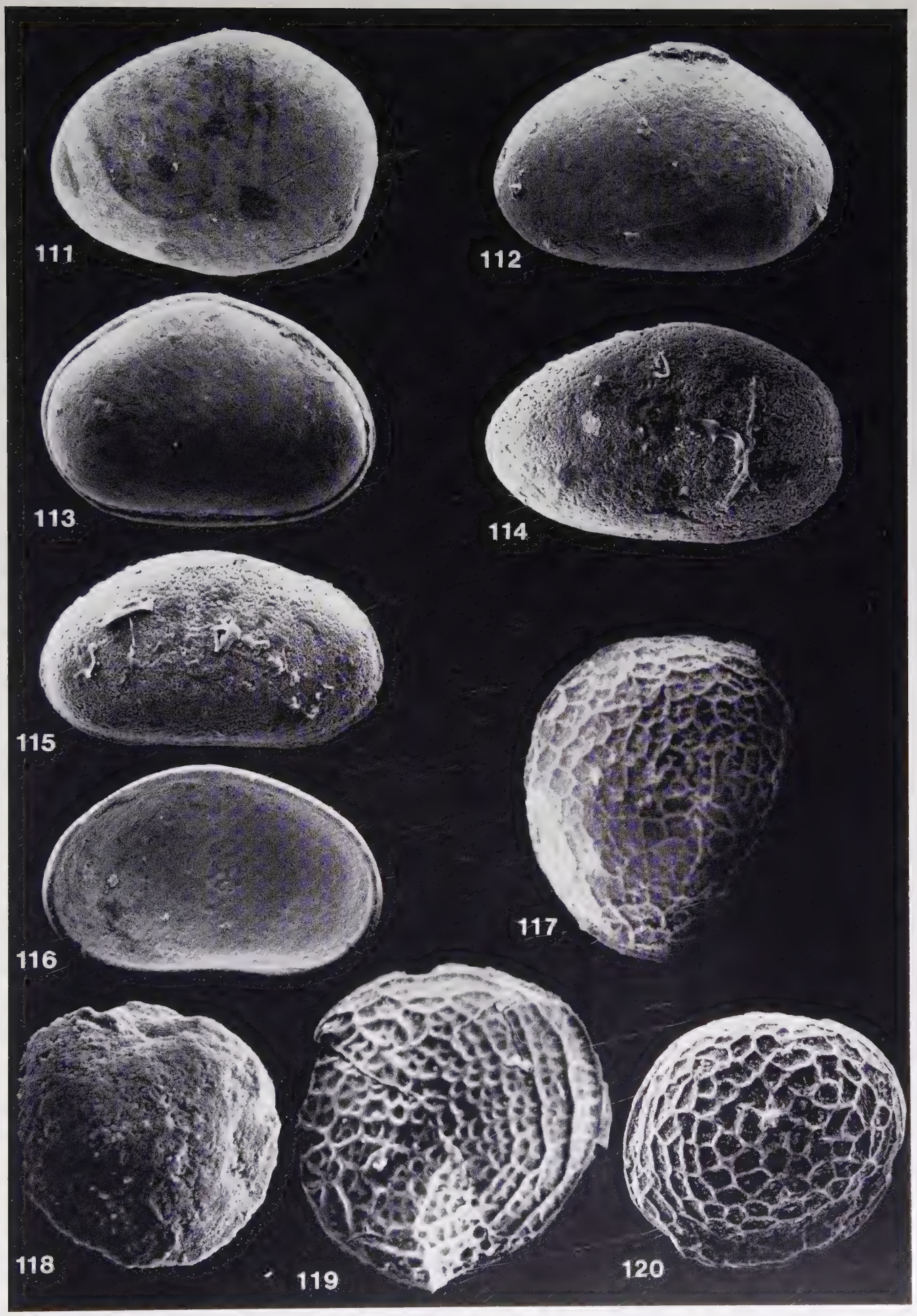
Fig. 116. *Ogmoconchella aequalis* HERRIG, 1969.
Right side, internal view. Sample No. RF4:123. SEM X 105. SGU Type 494.

Fig. 117. *Polycope plumhoffi* BATE & COLEMAN, 1975.
Carapace, left side. Sample No. Ka:778. SEM X 215. SGU Type 500.

Fig. 118. *Polycope minor* MICHELSEN, 1975.
Right side, external view. Sample No. 336:14. SEM X 330. SGU Type 501.

Fig. 119. *Polycope* n. sp.
Carapace, right side, holotype. Sample No. Ka:780. SEM X 320. SGU Type 503.

Fig. 120. *Polycope cerasia* BLAKE, 1876.
Carapace, left side. Sample No. Kä:41. SEM X 165. SGU Type 502.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